Q-16

ASBESTOS FIBRE MEASUREMENT SURVEY

My name is Doug Brown of the Ontario Research Foundation. We are doing a cross-Canada survey for Energy, Mines and Resources Canada to determine what work is being done on the measurement of inorganic fibres, particularly asbestos, in air and in water. This is needed for Energy, Mines and Resources own information and for the international technical co-operation program operated through the European Economic Community. Thus the information obtained in the survey will become public property.

Are you willing to spend a few minutes answering questions on your work in the area?

Name of Company Lakehead University, Resource Centre for Ontario
Address Occupational Health and Safety, Thunder Bay, Ontario P7B 5E1
Telephone No. (807) 345-2121 Ext. 671
Name of Interviewee George Boccanfuso
Position Industrial Hygienist

1. Is work being done there on fibre measurement or identification?
   No ____ Terminate interview.
   Yes x Continue with 2.

2. What types of fibres are you measuring or identifying?
   2.1 Asbestos? Yes x No ____
   2.1.1 If yes, what kinds of asbestos?
      Chrysotile x
      Amosite
      Crocidolite
      Anthophylite
      Tremolite
      Actinolite
   2.2 Other fibres? Yes ____ No x

2.2.1 If yes, what kinds of fibres?

(In this questionnaire we refer specifically to asbestos fibres, as our major area of interest. However, we would also like to hear about any other inorganic fibres you may be working with).

3. Are you measuring or identifying asbestos fibres in air?

No ____ Jump to Section 4.
Yes x What percentage of your work is measurement or identification in air as opposed to other media? 70 %.

3.1 What percentage of your work on air measurements is service work as opposed to research? 100 %

3.1.1 What percentage of your service work is on air from the work place as opposed to ambient air? 95 %

3.1.1.1 What percentage of your air measurements from the work place is personal as opposed to static? 3 %.

3.1.2. What general procedures do you use in your service work on air from the work place? (Include sampling, test procedure and instrumentation).

NIOSH

3.1.2.1 What modifications have you made in these procedures?

None

3.1.2.2 Have you developed any new instruments in your laboratory for use on air from the work place?

Yes _____ No __x__

If yes, please describe.

3.1.2.3 Have you imported any new instruments or attachments for use on air from the work place? Yes____ No __x__

If yes, please describe.

3.1.2.4 Are you obtaining information on sampling, test procedure, or instrumentation from outside Canada?

Yes x No ____

If yes, what sort of information and from whom?

From the literature only.

3.1.2.5 Are you participating in an information exchange with persons outside Canada? Yes ____ No x.

If yes, what sort of information are you exchanging, with whom, and on what basis? (through an organization (name?), personal contact, etc.).

3.1.3 What general procedures are you using on ambient air? (include sampling, test procedure and instrumentation).

NIOSH

3.1.3.1 What modifications have you made in these procedures?

None

3.1.3.2 Have you developed any new instruments or attachments for ambient air in your laboratory? Yes ____ No x___
If yes, please describe.

3.1.3.3 Have you imported any new instruments or attachments for ambient air? Yes ____ No _x_ .

If yes, please describe.

3.1.3.4 Are you obtaining information on sampling, test procedure or instrumentation for ambient air from outside Canada? Yes _x_ No ____

If yes, what sort of information and from whom?

From the literature only.

3.1.3.5 Are you participating in an information exchange with persons outside Canada on asbestos fibre measurements or identification in ambient air?

Yes ____ No x

If yes, what sort of information are you exchanging, with whom and on what basis? (through an organization (name?), personal contact, etc.).

3.1.4 How much service work is actually done there on asbestos fibre in air?

3.1.4.1 Samples/~~Day~~ Month: 5

3.1.4.2 Dollar Value: about $250/month

3.1.4.3 What is the source of funds for this work?

Cleints: mainly pulp and paper companies and school boards.

3.1.5 How long has your laboratory been doing service work in asbestos fibre measurement or identification in air? 1 years.

3.1.6 What future plans do you have for the service work in asbestos fibre measurement and identification in air? (include possible changes in method and equipment).

Expect to continue in present manner.

3.2 Presumably the proportion of your activity in fibre measurement and identification which is not service work, is research. Is this a correct assumption?

No _____. Please explain.

No research.

Yes ____. Continue through 3.2.1.

3.2.1 What research projects are underway on asbestos fibre measurement or identification in air?

3.2.1.1 On sampling?

3.2.1.2 On test procedures?

3.2.1.3 On instrumentation?

3.2.2 How much research work is actually done there on asbestos fibre measurement or identification in air?

3.2.2.1 Man-hours/week: _______

3.2.2.2 Dollar Value: _______

3.2.2.3 What is the source of funds for this work?

3.2.3 Have you imported any specialty instruments or attachments for your research work on asbestos fibre in air?

Yes _____ No _____

If yes, please describe.

____
____
____
____
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____
____

3.2.4 Are you obtaining information or participating in an information exchange on research into the measurement or identification of asbestos fibres in air with persons outside Canada?

Yes _____ No _____

If yes, what sort of information are you obtaining or exchanging, with whom and on what basis? (through an organization (name?) personal contact, etc.).

____
____
____
____
____
____
____
____
____
____

3.2.5 What past research work has your laboratory done on asbestos fibre measurement or identification in air?

3.2.5.1 On sampling?

3.2.5.2 On test procedures?

3.2.5.3 On instrumentation?

3.2.6 How long has your laboratory been doing research work on asbestos fibre measurement or identification in air?

3.2.7 What future research work is planned on asbestos fibre measurement or identification in air?

3.2.7.1 On sampling?

3.2.7.2 On test procedure?

3.2.7.3 On instrumentation?

4. Are you measuring or identifying asbestos fibres in water?

No _x___ Jump to Section 5.

Yes _____ What percentage of your work is measurement or identification in water as opposed to other media? _____%.

4.1 What percentage of your work on asbestos fibre measurement or identification in water is service work as opposed to research? _____%.

4.1.1 What general procedures do you use for asbestos fibre measurements or identification in water? (include sampling, test procedures and instrumentation).

4.1.1.1 What modifications have you made in these procedures?

4.1.1.2 Have you developed any new instruments or attachments in your laboratory for use in water measurement or identification? Yes ____ No _____

If yes, please describe? ____________________

4.1.1.3 Have you imported any new instruments or attachments for use in water measurement or identification?

Yes ____ No ____

If yes, please describe?

4.1.1.4 Are you obtaining information on sampling, test procedure or instrumentation for measurement or identification of asbestos fibre in water from outside Canada?

Yes ____ No _____

If yes, what sort of information and from whom?

4.1.1.4 (Continued) If yes, what sort of information and from whom?

____

____

____

____

____

____

4.1.1.5 Are you participating in an information exchange with persons outside Canada on asbestos fibre measurement or identification in water?

Yes____ No _____

If yes, what sort of information are you exchanging, with whom and on what basis? (through an organization (name), personal contact, etc.).

____

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4.1.2 How much service work is actually done there on the measurement and identification of asbestos fibres in water?

4.1.2.1 Man-hours/Week: ________

4.1.2.2 Dollar Value:

4.1.2.3 What is the source of funds for this work?

____

____

____

____

____

____

____

4.1.4 What are your future plans for asbestos fibre measurement and identification in water? (include possible changes in method and equipment.

4.2 Presumably, that proportion of your activity in asbestos fibre measurements or identification which is not service work, is research. Is this a correct assumption?

No _____ Please explain.

Yes ____ Continue through 4.2.1.

4.2.1 What research projects are underway on asbestos fibre measurement or identification in water?

4.2.1.1 On Sampling? ____

4.2.1.2 On test procedures?

4.2.1.3 On instrumentation?

4.2.2 How much research is actually done there on the measurement or identification of asbestos fibres in water?

4.2.2.1 Man-hours/week:

4.2.2.2 Dollar Value:

4.2.2.3 What is the source of funds for this work?

4.2.3 Have you imported any new instruments or attachments for your research work on asbestos fibre in water?

Yes ______ No ______

If yes, please describe.

4.2.4 Are you obtaining information or participating in an information exchange on research into the measurement or identification of asbestos fibres in water with persons outside Canada?

Yes ______ No ______

If yes, what sort of information are you obtaining or exchanging, with whom and on what basis? (through an organization (name?) personal contact, etc.).

4.2.5 What past research work has your laboratory done on asbestos fibre measurement or identification in water?

4.2.5.1 On sampling?

4.2.5.2 On test procedures?

4.2.5.3 On instrumentation?

4.2.6 How long has your laboratory been doing research work on asbestos fibre measurement or identification in water?

4.2.7 What future research work is planned on asbestos fibre measurement or identification in water?

4.2.7.1 On sampling?

4.2.7.2 On test procedure?

4.2.7.3 On instrumentation?

5. Have you done any asbestos fibre identification in biological samples?

Yes ____ No x

If yes, on what samples and under what circumstances?

5.1 What procedures are you using on biological samples?

5.1.1 What modifications have you made in these procedures?

6. Have you done any asbestos fibre measurement or identification in media other than air, water or biological specimens?

Yes x NO

If yes, on what materials and under what circumstances?

Insulation

6.1 What procedures do you use?

Polarizing microscope to compare indices or diffraction;
Scanning x-ray diffraction;
Scanning electron microscope

6.1.1 What modifications have you made in these procedures?

7. Who else do you know in Canada is working on inorganic fibre measurement or identification?

Dr. Sullivan at Western University.

8. What areas of research do you think deserve further work?

- Development of more objective method for fibre counting.
- Work relating fibre count to physiological effect: "Is one fibre per c.c. safe?"

Interviewer: W.D. Brown Date: November 10, 1980

Q-17

ASBESTOS FIBRE MEASUREMENT SURVEY

My name is Doug Brown of the Ontario Research Foundation. We are doing a cross-Canada survey for Energy, Mines and Resources Canada to determine what work is being done on the measurement of inorganic fibres, particularly asbestos, in air and in water. This is needed for Energy, Mines and Resources own information and for the international technical co-operation program operated through the European Economic Community. Thus the information obtained in the survey will become public property.

Are you willing to spend a few minutes answering questions on your work in the area?

Name of Company McMaster University
Address Department of Geology
Telephone No. 525-9140, Ext. 4514
Name of Interviewee Dr. J.R. Kramer
Position Professor of Geology

1. Is work being done there on fibre measurement or identification?
   No ____ Terminate interview.
   Yes x Continue with 2.

2. What types of fibres are you measuring or identifying?
   2.1 Asbestos? Yes x No ____
   2.1.1 If yes, what kinds of asbestos?
   Chrysotile x
   Amosite
   Crocidolite
   Anthophylite
   Tremolite
   Actinolite
   2.2 Other fibres? Yes x No ____

2.2.1 If yes, what kinds of fibres?

Unidentified material

(In this questionnaire we refer specifically to asbestos fibres, as our major area of interest. However, we would also like to hear about any other inorganic fibres you may be working with).

3. Are you measuring or identifying asbestos fibres in air?

No ____ Jump to Section 4.

Yes x What percentage of your work is measurement or identification in air as opposed to other media? 15 %.

3.1 What percentage of your work on air measurements is service work as opposed to research? 0 %

3.1.1 What percentage of your service work is on air from the work place as opposed to ambient air? ______%

3.1.1.1 What percentage of your air measurements from the work place is personal as opposed to static? ____%.

3.1.2. What general procedures do you use in your service work on air from the work place? (Include sampling, test procedure and instrumentation).

The EPA Revised Air Method is used in the present (Baie Verte) research study.

3.1.2.1 What modifications have you made in these procedures?

None.

3.1.2.2 Have you developed any new instruments in your laboratory for use on air from the work place? Yes _____ No __x__

If yes, please describe.

3.1.2.3 Have you imported any new instruments or attachments for use on air from the work place? Yes ____ No __x__

If yes, please describe.

3.1.2.4 Are you obtaining information on sampling, test procedure, or instrumentation from outside Canada?

Yes _x_ No _____

If yes, what sort of information and from whom?

EPA Method is from U.S. Technical literature from U.S. and Europe is studied.

3.1.2.5 Are you participating in an information exchange with persons outside Canada? Yes _____ No _x_.

If yes, what sort of information are you exchanging, with whom, and on what basis? (through an organization (name?), personal contact, etc.).

3.1.3 What general procedures are you using on ambient air? (include sampling, test procedure and instrumentation).

Same as 3.1.2.4

3.1.3.1 What modifications have you made in these procedures?

3.1.3.2 Have you developed any new instruments or attachments for ambient air in your laboratory? Yes ____ No x

If yes, please describe.

3.1.3.3 Have you imported any new instruments or attachments for ambient air? Yes ____ No __x__.

If yes, please describe.

3.1.3.4 Are you obtaining information on sampling, test procedure or instrumentation for ambient air from outside Canada?

Yes __x__ No ____

If yes, what sort of information and from whom?

EPA Method from U.S. Technical literature.

3.1.3.5 Are you participating in an information exchange with persons outside Canada on asbestos fibre measurements or identification in ambient air?

Yes ____ No _x_

If yes, what sort of information are you exchanging, with whom and on what basis? (through an organization (name?), personal contact, etc.).

3.1.4 How much service work is actually done there on asbestos fibre in air?

3.1.4.1 Samples/Day: All research

3.1.4.2 Dollar Value: ____________

3.1.4.3 What is the source of funds for this work?

3.1.5 How long has your laboratory been doing service work in asbestos fibre measurement or identification in air? ____ years.

3.1.6 What future plans do you have for the service work in asbestos fibre measurement and identification in air? (include possible changes in method and equipment).

3.2 Presumably the proportion of your activity in fibre measurement and identification which is not service work, is research. Is this a correct assumption?

No _____. Please explain.

100% research

Yes x. Continue through 3.2.1.

3.2.1 What research projects are underway on asbestos fibre measurement or identification in air?

3.2.1.1 On sampling?

Atmospheric and water concentrations, transport, and size distributions in the vicinity of Baie Verte, Newfoundland (Advocate Mine).

3.2.1.2 On test procedures?

3.2.1.3 On instrumentation?

3.2.2 How much research work is actually done there on asbestos fibre measurement or identification in air?

3.2.2.1 3/4 Man-years/year

3.2.2.2 Dollar Value: ________

3.2.2.3 What is the source of funds for this work?

Environment Canada is sponsor of the Baie Verte study. Most projects are sponsored by government authorities.

3.2.3 Have you imported any specialty instruments or attachments for your research work on asbestos fibre in air?

Yes _____ No __x__

If yes, please describe.

3.2.4 Are you obtaining information or participating in an information exchange on research into the measurement or identification of asbestos fibres in air with persons outside Canada?

Yes _____ No __x__

If yes, what sort of information are you obtaining or exchanging, with whom and on what basis? (through an organization (name?) personal contact, etc.).

3.2.5 What past research work has your laboratory done on asbestos fibre measurement or identification in air?

3.2.5.1 On sampling?

3.2.5.2 On test procedures?

3.2.5.3 On instrumentation?

3.2.6 How long has your laboratory been doing research work on asbestos fibre measurement or identification in air?

Five years -
Most of the work has been in water.

3.2.7 What future research work is planned on asbestos fibre measurement or identification in air?

To look at non-asbestos mineral fibres, e.g. Wollastonite.

3.2.7.1 On sampling?

3.2.7.2 On test procedure?

3.2.7.3 On instrumentation?

4. Are you measuring or identifying asbestos fibres in water?

No _____ Jump to Section 5.

Yes x What percentage of your work is measurement or identification in water as opposed to other media? 85 %.

4.1 What percentage of your work on asbestos fibre measurement or identification in water is service work as opposed to research? 10 %.

4.1.1 What general procedures do you use for asbestos fibre measurements or identification in water? (include sampling, test procedures and instrumentation).

TEM, IDAX, SEM

4.1.1.1 What modifications have you made in these procedures?

We developed sonification method of transfer.

4.1.1.2 Have you developed any new instruments or attachments in your laboratory for use in water measurement or identification? Yes ____ No __x__

If yes, please describe? ________________

4.1.1.3 Have you imported any new instruments or attachments for use in water measurement or identification?

Yes ____ No __x__

If yes, please describe?

4.1.1.4 Are you obtaining information on sampling, test procedure or instrumentation for measurement or identification of asbestos fibre in water from outside Canada?

Yes __x__ No _____

If yes, what sort of information and from whom?

Technical literature only.

4.1.1.4 (Continued) If yes, what sort of information and from whom?

4.1.1.5 Are you participating in an information exchange with persons outside Canada on asbestos fibre measurement or identification in water?

Yes x No ____

If yes, what sort of information are you exchanging, with whom and on what basis? (through an organization (name), personal contact, etc.).

Minnisota Department of Health.

4.1.2 How much service work is actually done there on the measurement and identification of asbestos fibres in water?

4.1.2.1 3 Weeks/Year

4.1.2.2 Dollar Value:

4.1.2.3 What is the source of funds for this work?

Government and industry.

4.1.4 What are your future plans for asbestos fibre measurement and identification in water? (include possible changes in method and equipment.

Interested in analysis using oriented samples obtaining by microtoming.

4.2 Presumably, that proportion of your activity in asbestos fibre measurements or identification which is not service work, is research. Is this a correct assumption?

No _____ Please explain.

Yes _x_ Continue through 4.2.1.

4.2.1 What research projects are underway on asbestos fibre measurement or identification in water?

4.2.1.1 On Sampling?

As described in 3.2.1.

4.2.1.2 On test procedures?

4.2.1.3 On instrumentation?

4.2.2 How much research is actually done there on the measurement or identification of asbestos fibres in water?

4.2.2.1 3/4 Man-Years/Year

4.2.2.2 Dollar Value:

4.2.2.3 What is the source of funds for this work?

Environment Canada

4.2.3 Have you imported any new instruments or attachments for your research work on asbestos fibre in water?

Yes ______ No __x__

If yes, please describe.

4.2.4 Are you obtaining information or participating in an information exchange on research into the measurement or identification of asbestos fibres in water with persons outside Canada?

Yes ______ No __x__

If yes, what sort of information are you obtaining or exchanging, with whom and on what basis? (through an organization (name?) personal contact, etc.).

4.2.5 What past research work has your laboratory done on asbestos fibre measurement or identification in water?

4.2.5.1 On sampling? Amphibole concentrations and mineralogy in the Wabush area of Labrador. Characterization of fibre in Wabush Lake and Mineralogical studies of deposits. Mineralogical studies and fibre concentrations in Taconite at Silver Bay, Minnisota.

4.2.5.2 On test procedures?

4.2.5.3 On instrumentation?

4.2.6 How long has your laboratory been doing research work on asbestos fibre measurement or identification in water? Five years.

4.2.7 What future research work is planned on asbestos fibre measurement or identification in water?

4.2.7.1 On sampling?

To look at non-asbestos mineral fibres, e.g. Wollastonite.

4.2.7.2 On test procedure?

4.2.7.3 On instrumentation?

5. Have you done any asbestos fibre identification in biological samples?

Yes x No ____

If yes, on what samples and under what circumstances?

Have done some work on fibres in fish.

5.1 What procedures are you using on biological samples?

Following National Health and Welfare (Pontefract and Cunningham).

5.1.1 What modifications have you made in these procedures?

Nothing significant.

6. Have you done any asbestos fibre measurement or identification in media other than air, water or biological specimens?

Yes x NO ____

If yes, on what materials and under what circumstances?

Mineralogical samples.

6.1 What procedures do you use?

EM, X-ray diffraction, IR spectra and

chemical analysis.

6.1.1 What modifications have you made in these procedures?

7. Who else do you know in Canada is working on inorganic fibre measurement or identification?

Ontario Research Foundation

McMaster - Dave Verma

8. What areas of research do you think deserve further work?

1. Precise Mineralogical characterization relative to physiological effects.

2. In analysis: (a) particle splitting by sonification.

(b) study of very small fibre loss in Jaffe-Wick method.

3. Physiological effects of non-asbestos mineral fibres.

Interviewer: W.D. Brown

Date: December 3, 1980

Q-18

ASBESTOS FIBRE MEASUREMENT SURVEY

My name is Doug Brown of the Ontario Research Foundation. We are doing a cross-Canada survey for Energy, Mines and Resources Canada to determine what work is being done on the measurement of inorganic fibres, particularly asbestos, in air and in water. This is needed for Energy, Mines and Resources own information and for the international technical co-operation program operated through the European Economic Community. Thus the information obtained in the survey will become public property.

Are you willing to spend a few minutes answering questions on your work in the area?

Name of Company McMaster University, Occupational Health Program
Address 1200 Main Street, W. Hamilton, L8N 3Z5
Telephone No. 525-9140 X2333
Name of Interviewee Dr. Dave Verma
Position Assistant Professor, Occupational Hygienist & Laboratory Director

1. Is work being done there on fibre measurement or identification?
   No ____ Terminate interview.
   Yes x Continue with 2.

2. What types of fibres are you measuring or identifying?
   2.1 Asbestos? Yes x No ____
   2.1.1 If yes, what kinds of asbestos?
      Chrysotile X
      Amosite X
      Crocidolite X
      Anthophylite X
      Tremolite X
      Actinolite X
   2.2 Other fibres? Yes X No ____

2.2.1 If yes, what kinds of fibres?

Mineral fibre including glass (identify as such)

(In this questionnaire we refer specifically to asbestos fibres, as our major area of interest. However, we would also like to hear about any other inorganic fibres you may be working with).

3. Are you measuring or identifying asbestos fibres in air?

No ____ Jump to Section 4.

Yes X What percentage of your work is measurement or identification in air as opposed to other media? 50 %.

3.1 What percentage of your work on air measurements is service work as opposed to research? 90 %

3.1.1 What percentage of your service work is on air from the work place as opposed to ambient air? 50 %

3.1.1.1 What percentage of your air measurements from the work place is personal as opposed to static? 60 %.

3.1.2. What general procedures do you use in your service work on air from the work place? (Include sampling, test procedure and instrumentation).

NIOSH - Phase contrast

3.1.2.1 What modifications have you made in these procedures?

No significant ones.

3.1.2.2 Have you developed any new instruments in your laboratory for use on air from the work place?

Yes ____ No x

If yes, please describe.

3.1.2.3 Have you imported any ~~new~~ speciality instruments or attachments for use on air from the work place? Yes ____ No x

If yes, please describe.

3.1.2.4 Are you obtaining information on sampling, test procedure, or instrumentation from outside Canada?

Yes x No ____

If yes, what sort of information and from whom?

NIOSH and personal contacts in Britain and Germany.

3.1.2.5 Are you participating in an information exchange with persons outside Canada? Yes x No ____.

If yes, what sort of information are you exchanging, with whom, and on what basis? (through an organization (name?), personal contact, etc.).

Personal contacts in Britain and Germany (Dr. Timbrell in Britain)

3.1.3 What general procedures are you using on ambient air? (include sampling, test procedure and instrumentation).

Not completely set-up at present.

EPA Procedure - when they get going.

3.1.3.1 What modifications have you made in these procedures?

Some modifications

- but program set back by a member of the staff leaving.

3.1.3.2 Have you developed any new instruments or attachments for ambient air in your laboratory? Yes ____ No x

If yes, please describe.

3.1.3.3 Have you imported any new instruments or attachments for ambient air? Yes ____ No _x_.

If yes, please describe.

Standard equipment is used.

3.1.3.4 Are you obtaining information on sampling, test procedure or instrumentation for ambient air from outside Canada? Yes _X_ No ____

If yes, what sort of information and from whom?

On sampling - test procedure and instrumentation, from NIOSH and personal contacts in Britain and Germany.

3.1.3.5 Are you participating in an information exchange with persons outside Canada on asbestos fibre measurements or identification in ambient air?

Yes ____ No x

If yes, what sort of information are you exchanging, with whom and on what basis? (through an organization (name?), personal contact, etc.).

3.1.4 How much service work is actually done there on asbestos fibre in air?

3.1.4.1 Samples/Day: --

3.1.4.2 Dollar Value: --

3.1.4.3 What is the source of funds for this work?

Industry, local school boards, etc.

3.1.5 How long has your laboratory been doing service work in asbestos fibre measurement or identification in air? 2 years.

3.1.6 What future plans do you have for the service work in asbestos fibre measurement and identification in air? (include possible changes in method and equipment).

Wish to investigate other methods, particularly Electron Microscopy.

3.2 Presumably the proportion of your activity in fibre measurement and identification which is not service work, is research. Is this a correct assumption?

No _____. Please explain.

Yes X. Continue through 3.2.1.

3.2.1 What research projects are underway on asbestos fibre measurement or identification in air?

3.2.1.1 On sampling?

Looking at various methods for ambient air (internally funded).

3.2.1.2 On test procedures?

Looking at various methods for ambient air.

3.2.1.3 On instrumentation?

Looking at field instruments for analysis.

3.2.2 How much research work is actually done there on asbestos fibre measurement or identification in air?

3.2.2.1 Man-hours/week: c.17

3.2.2.2 Dollar Value: ______

3.2.2.3 What is the source of funds for this work?

Provincial Government.

3.2.3 Have you imported any specialty instruments or attachments for your research work on asbestos fibre in air?

Yes _____ No X_____

If yes, please describe.

3.2.4 Are you obtaining information or participating in an information exchange on research into the measurement or identification of asbestos fibres in air with persons outside Canada?

Yes X_____ No _____

If yes, what sort of information are you obtaining or exchanging, with whom and on what basis? (through an organization (name?) personal contact, etc.).

Same as 3.1.2.4 and 3.1.2.5

3.2.5 What past research work has your laboratory done on asbestos fibre measurement or identification in air?

3.2.5.1 On sampling?

We have looked at total inhalable sampling and the criteria of sampling.

3.2.5.2 On test procedures?

We have looked at various methods used internationally.

3.2.5.3 On instrumentation?

None.

3.2.6 How long has your laboratory been doing research work on asbestos fibre measurement or identification in air?

Two years.

3.2.7 What future research work is planned on asbestos fibre measurement or identification in air?

3.2.7.1 On sampling?

Same as 3.2.5

3.2.7.2 On test procedure?

Same as 3.2.5

3.2.7.3 On instrumentation?

Wants to look at magnetic alignment.

4. Are you measuring or identifying asbestos fibres in water?

No X Jump to Section 5.

Yes _____ What percentage of your work is measurement or identification in water as opposed to other media? _____%.

4.1 What percentage of your work on asbestos fibre measurement or identification in water is service work as opposed to research? _____%.

4.1.1 What general procedures do you use for asbestos fibre measurements or identification in water? (include sampling, test procedures and instrumentation).

4.1.1.1 What modifications have you made in these procedures?

4.1.1.2 Have you developed any new instruments or attachments in your laboratory for use in water measurement or identification? Yes ____ No _____

If yes, please describe? ______________________________

4.1.1.3 Have you imported any new instruments or attachments for use in water measurement or identification?

Yes ____ No ____

If yes, please describe?

4.1.1.4 Are you obtaining information on sampling, test procedure or instrumentation for measurement or identification of asbestos fibre in water from outside Canada?

Yes ____ No _____

If yes, what sort of information and from whom?

4.1.1.4 (Continued) If yes, what sort of information and from whom?

4.1.1.5 Are you participating in an information exchange with persons outside Canada on asbestos fibre measurement or identification in water?

Yes____ No _____

If yes, what sort of information are you exchanging, with whom and on what basis? (through an organization (name), personal contact, etc.).

4.1.2 How much service work is actually done there on the measurement and identification of asbestos fibres in water?

4.1.2.1 Man-hours/Week: ________

4.1.2.2 Dollar Value:

4.1.2.3 What is the source of funds for this work?

4.1.4 What are your future plans for asbestos fibre measurement and identification in water? (include possible changes in method and equipment.

4.2 Presumably, that proportion of your activity in asbestos fibre measurements or identification which is not service work, is research. Is this a correct assumption?

No _____ Please explain.

Yes ____ Continue through 4.2.1.

4.2.1 What research projects are underway on asbestos fibre measurement or identification in water?

4.2.1.1 On Sampling? ____

4.2.1.2 On test procedures?

4.2.1.3 On instrumentation?

4.2.2 How much research is actually done there on the measurement or identification of asbestos fibres in water?

4.2.2.1 Man-hours/week:
4.2.2.2 Dollar Value:

4.2.2.3 What is the source of funds for this work?

4.2.3 Have you imported any new instruments or attachments for your research work on asbestos fibre in water?

Yes ______ No ______

If yes, please describe.

4.2.4 Are you obtaining information or participating in an information exchange on research into the measurement or identification of asbestos fibres in water with persons outside Canada?

Yes ______ No ______

If yes, what sort of information are you obtaining or exchanging, with whom and on what basis? (through an organization (name?) personal contact, etc.).

4.2.5 What past research work has your laboratory done on asbestos fibre measurement or identification in water?

4.2.5.1 On sampling?

4.2.5.2 On test procedures?

4.2.5.3 On instrumentation?

4.2.6 How long has your laboratory been doing research work on asbestos fibre measurement or identification in water?

4.2.7 What future research work is planned on asbestos fibre measurement or identification in water?

4.2.7.1 On sampling? ______

4.2.7.2 On test procedure? ______

4.2.7.3 On instrumentation? ______

5. Have you done any asbestos fibre identification in biological samples?

Yes X No ____

If yes, on what samples and under what circumstances?

We have done preliminary work only, on lung and other tissues.

5.1 What procedures are you using on biological samples?

We have tried out various international procedures, such as those from U.K. and U.S.A.

5.1.1 What modifications have you made in these procedures?

Have made some minor modifications: we developed a concentrator to concentrate the fibres when they are at a low level of concentration.

6. Have you done any asbestos fibre measurement or identification in media other than air, water or biological specimens?

Yes X NO ____

If yes, on what materials and under what circumstances?

Service work on sprayed-on insulation and similar materials.

6.1 What procedures do you use?

- Optical microscopy, IR, X-ray, and EM for asbestos where there are interfering materials present.
- K2 test from NIOSH

6.1.1 What modifications have you made in these procedures?

Modifications have been made to avoid interference from other materials.

7. Who else do you know in Canada is working on inorganic fibre measurement or identification?

Kramer - on water (McMaster)
Alberta Government
Federal Government
Quebec Mining Companies
Jeff Knight - Elliot Lake
McGill University
Canada Centre for Inland Waters (Bob Durham)

8. What areas of research do you think deserve further work?

(1) More inter-laboratory counting

(2) New method developed for low level exposure

(3) A new instrument or combination of instruments for fibre monitoring

Interviewer: W.D. Brown Date: 29/10/80

Q-19

ASBESTOS FIBRE MEASUREMENT SURVEY

My name is Doug Brown of the Ontario Research Foundation. We are doing a cross-Canada survey for Energy, Mines and Resources Canada to determine what work is being done on the measurement of inorganic fibres, particularly asbestos, in air and in water. This is needed for Energy, Mines and Resources own information and for the international technical co-operation program operated through the European Economic Community. Thus the information obtained in the survey will become public property.

Are you willing to spend a few minutes answering questions on your work in the area?

Name of Company Queen's University, Occupational Health and Safety
Address Resource Centre, Health Sciences, 25 Union Street, Kingston, Ont. K7L 2N6
Telephone No. (613) 547-5749
Name of Interviewee Gordon W. Dunn
Position Occupational Hygienist

1. Is work being done there on fibre measurement or identification?

   No ____ Terminate interview.

   Yes x Continue with 2.

2. What types of fibres are you measuring or identifying?

   2.1 Asbestos? Yes x No ____

   2.1.1 If yes, what kinds of asbestos?

Chrysotile	×
Amosite	×
Crocidolite	×
Anthophylite	×
Tremolite	×
Actinolite	×

   2.2 Other fibres? Yes x No ____

2.2.1 If yes, what kinds of fibres?

glass, talc

(In this questionnaire we refer specifically to asbestos fibres, as our major area of interest. However, we would also like to hear about any other inorganic fibres you may be working with).

3. Are you measuring or identifying asbestos fibres in air?

No ____ Jump to Section 4.

Yes x What percentage of your work is measurement or identification in air as opposed to other media? 40 %.

3.1 What percentage of your work on air measurements is service work as opposed to research? 99 %

3.1.1 What percentage of your service work is on air from the work place as opposed to ambient air? 50 %

3.1.1.1 What percentage of your air measurements from the work place is personal as opposed to static? 60 %.

3.1.2. What general procedures do you use in your service work on air from the work place? (Include sampling, test procedure and instrumentation).

NIOSH used for counting

Air sampling uses recommended method by AIHA - which in effect is the same as NIOSH.

3.1.2.1 What modifications have you made in these procedures?

None

3.1.2.2 Have you developed any new instruments in your laboratory for use on air from the work place?

Yes _____ No _x___

If yes, please describe.

3.1.2.3 Have you imported any new instruments or attachments for use on air from the work place? Yes____ No _x__

If yes, please describe.

3.1.2.4 Are you obtaining information on sampling, test procedure, or instrumentation from outside Canada?

Yes x No _____

If yes, what sort of information and from whom?

Only through AIHA and ACGIH and from the literature.

3.1.2.5 Are you participating in an information exchange with persons outside Canada? Yes x No _____.

If yes, what sort of information are you exchanging, with whom, and on what basis? (through an organization (name?), personal contact, etc.).

Only through AIHA and ACGIH.

3.1.3 What general procedures are you using on ambient air? (include sampling, test procedure and instrumentation).

Air in buildings only

Same procedures as in 3.1.2.

3.1.3.1 What modifications have you made in these procedures?

Longer sampling time for ambient (3-18 hrs)

3.1.3.2 Have you developed any new instruments or attachments for ambient air in your laboratory? Yes ____ No x

If yes, please describe.

3.1.3.3 Have you imported any new instruments or attachments for ambient air? Yes ____ No __x__.

If yes, please describe.

3.1.3.4 Are you obtaining information on sampling, test procedure or instrumentation for ambient air from outside Canada?

Yes __x__ No ____

If yes, what sort of information and from whom?

Through AIHA and ACGIH, and through the literature.

3.1.3.5 Are you participating in an information exchange with persons outside Canada on asbestos fibre measurements or identification in ambient air?

Yes x No ____

If yes, what sort of information are you exchanging, with whom and on what basis? (through an organization (name?), personal contact, etc.).

Through AIHA and ACGIH.

3.1.4 How much service work is actually done there on asbestos fibre in air?

3.1.4.1 Samples/~~Day~~ Month: 15

3.1.4.2 Dollar Value: $30 per sample = $450/month

3.1.4.3 What is the source of funds for this work?

Fees from clients.

3.1.5 How long has your laboratory been doing service work in asbestos fibre measurement or identification in air? 2-3 years.

3.1.6 What future plans do you have for the service work in asbestos fibre measurement and identification in air? (include possible changes in method and equipment).

Expect to carry on as now.

3.2 Presumably the proportion of your activity in fibre measurement and identification which is not service work, is research. Is this a correct assumption?

No _____. Please explain.

Yes × . Continue through 3.2.1.

3.2.1 What research projects are underway on asbestos fibre measurement or identification in air?

3.2.1.1 On sampling?

None

3.2.1.2 On test procedures?

Improvement in x-ray diffraction analysis to give greater accuracy.

3.2.1.3 On instrumentation?

As above.

3.2.2 How much research work is actually done there on asbestos fibre measurement or identification in air?

3.2.2.1 Man-hours/~~week~~ month: 4

3.2.2.2 Dollar Value: -

3.2.2.3 What is the source of funds for this work?

Internally sponsored.

3.2.3 Have you imported any specialty instruments or attachments for your research work on asbestos fibre in air?

Yes _____ No __x__

If yes, please describe.

3.2.4 Are you obtaining information or participating in an information exchange on research into the measurement or identification of asbestos fibres in air with persons outside Canada?

Yes __x__ No _____

If yes, what sort of information are you obtaining or exchanging, with whom and on what basis? (through an organization (name?) personal contact, etc.).

Mostly through literature and through AIHA and ACGIH.

3.2.5 What past research work has your laboratory done on asbestos fibre measurement or identification in air?

3.2.5.1 On sampling?

None

3.2.5.2 On test procedures?

None

3.2.5.3 On instrumentation?

None

3.2.6 How long has your laboratory been doing research work on asbestos fibre measurement or identification in air?

2 - 3 years

3.2.7 What future research work is planned on asbestos fibre measurement or identification in air?

3.2.7.1 On sampling?

None

3.2.7.2 On test procedure?

None

3.2.7.3 On instrumentation?

None

4. Are you measuring or identifying asbestos fibres in water?

No × Jump to Section 5.

Yes _____ What percentage of your work is measurement or identification in water as opposed to other media? _____%.

4.1 What percentage of your work on asbestos fibre measurement or identification in water is service work as opposed to research? _____%.

4.1.1 What general procedures do you use for asbestos fibre measurements or identification in water? (include sampling, test procedures and instrumentation).

4.1.1.1 What modifications have you made in these procedures?

4.1.1.2 Have you developed any new instruments or attachments in your laboratory for use in water measurement or identification? Yes ____ No _____

If yes, please describe? ______________________________

4.1.1.3 Have you imported any new instruments or attachments for use in water measurement or identification?

Yes ____ No ____

If yes, please describe?

4.1.1.4 Are you obtaining information on sampling, test procedure or instrumentation for measurement or identification of asbestos fibre in water from outside Canada?

Yes ____ No _____

If yes, what sort of information and from whom?

4.1.1.4 (Continued) If yes, what sort of information and from whom?

4.1.1.5 Are you participating in an information exchange with persons outside Canada on asbestos fibre measurement or identification in water?

Yes____ No ____

If yes, what sort of information are you exchanging, with whom and on what basis? (through an organization (name), personal contact, etc.).

4.1.2 How much service work is actually done there on the measurement and identification of asbestos fibres in water?

4.1.2.1 Man-hours/Week: ________

4.1.2.2 Dollar Value:

4.1.2.3 What is the source of funds for this work?

4.1.4 What are your future plans for asbestos fibre measurement and identification in water? (include possible changes in method and equipment.

4.2 Presumably, that proportion of your activity in asbestos fibre measurements or identification which is not service work, is research. Is this a correct assumption?

No _____ Please explain.

Yes ____ Continue through 4.2.1.

4.2.1 What research projects are underway on asbestos fibre measurement or identification in water?

4.2.1.1 On Sampling? ____________

4.2.1.2 On test procedures?

4.2.1.3 On instrumentation?

4.2.2 How much research is actually done there on the measurement or identification of asbestos fibres in water?

4.2.2.1 Man-hours/week:
4.2.2.2 Dollar Value:

4.2.2.3 What is the source of funds for this work?

4.2.3 Have you imported any new instruments or attachments for your research work on asbestos fibre in water?

Yes ______ No ______

If yes, please describe.

4.2.4 Are you obtaining information or participating in an information exchange on research into the measurement or identification of asbestos fibres in water with persons outside Canada?

Yes ______ No ______

If yes, what sort of information are you obtaining or exchanging, with whom and on what basis? (through an organization (name?) personal contact, etc.).

4.2.5 What past research work has your laboratory done on asbestos fibre measurement or identification in water?

4.2.5.1 On sampling?______________________________

4.2.5.2 On test procedures? ______________________________

4.2.5.3 On instrumentation? ______________________________

4.2.6 How long has your laboratory been doing research work on asbestos fibre measurement or identification in water?______________________________

4.2.7 What future research work is planned on asbestos fibre measurement or identification in water?

4.2.7.1 On sampling? ______

4.2.7.2 On test procedure? ______

4.2.7.3 On instrumentation? ______

5. Have you done any asbestos fibre identification in biological samples?

Yes _____ No __x__

If yes, on what samples and under what circumstances?

5.1 What procedures are you using on biological samples?

5.1.1 What modifications have you made in these procedures?

6. Have you done any asbestos fibre measurement or identification in media other than air, water or biological specimens?

Yes x NO _____

If yes, on what materials and under what circumstances?

Mainly insulation

6.1 What procedures do you use?

X-ray diffraction and optical microscopy.

6.1.1 What modifications have you made in these procedures?

7. Who else do you know in Canada is working on inorganic fibre measurement or identification?

Dr. John Sullivan - University of Western Ontario

Dr. Gordon Brag - University of Waterloo

8. What areas of research do you think deserve further work?

- Investigation into relationship of fibre diameter to physiological effects.
- New counting method should be developed in which individual fibres can be identified for counting.
- Development of a cheap, reliable method of counting fibres below optical microscope range.

Interviewer: W.D. Brown Date: December 4, 1980

Q-20

ASBESTOS FIBRE MEASUREMENT SURVEY

My name is Doug Brown of the Ontario Research Foundation. We are doing a cross-Canada survey for Energy, Mines and Resources Canada to determine what work is being done on the measurement of inorganic fibres, particularly asbestos, in air and in water. This is needed for Energy, Mines and Resources own information and for the international technical co-operation program operated through the European Economic Community. Thus the information obtained in the survey will become public property.

Are you willing to spend a few minutes answering questions on your work in the area?

Name of Company	University of Toronto, Medical Faculty
Address	Div. of Community Medicine, Occupational & Environmental Health Unit
Telephone No.	978-4353
Name of Interviewee	Dr. James Stopps
Position	Acting Director of the Unit.

1. Is work being done there on fibre measurement or identification?
   No ____ Terminate interview.
   Yes x Continue with 2.

2. What types of fibres are you measuring or identifying?
   2.1 Asbestos? Yes x No ____
   2.1.1 If yes, what kinds of asbestos?
   - Chrysotile x
   - Amosite
   - Crocidolite x
   - Anthophylite
   - Tremolite
   - Actinolite

   2.2 Other fibres? Yes x No ____

2.2.1 If yes, what kinds of fibres?
glass and mineral wool

(In this questionnaire we refer specifically to asbestos fibres, as our major area of interest. However, we would also like to hear about any other inorganic fibres you may be working with).

3. Are you measuring or identifying asbestos fibres in air?
No ____ Jump to Section 4.
Yes x What percentage of your work is measurement or identification in air as opposed to other media? 60 %.

3.1 What percentage of your work on air measurements is service work as opposed to research? 100 %

3.1.1 What percentage of your service work is on air from the work place as opposed to ambient air? 0 %

- All ambient, from inside buildings containing asbestos insulation.

3.1.1.1 What percentage of your air measurements from the work place is personal as opposed to static? ____%.

3.1.2. What general procedures do you use in your service work on air from the work place? (Include sampling, test procedure and instrumentation).

No work place air from an asbestos manufacturer or converter.

Only air from buildings containing insulation.

3.1.2.1 What modifications have you made in these procedures?

3.1.2.2 Have you developed any new instruments in your laboratory for use on air from the work place?

Yes _____ No _____

If yes, please describe.

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3.1.2.3 Have you imported any new instruments or attachments for use on air from the work place? Yes____ No ____

If yes, please describe.

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3.1.2.4 Are you obtaining information on sampling, test procedure, or instrumentation from outside Canada?

Yes _____ No _____

If yes, what sort of information and from whom?

3.1.2.5 Are you participating in an information exchange with persons outside Canada? Yes _____ No _____.

If yes, what sort of information are you exchanging, with whom, and on what basis? (through an organization (name?), personal contact, etc.).

3.1.3 What general procedures are you using on ambient air? (include sampling, test procedure and instrumentation).

NIOSH P & CAM 239

3.1.3.1 What modifications have you made in these procedures?

None.

3.1.3.2 Have you developed any new instruments or attachments for ambient air in your laboratory? Yes ____ No x
If yes, please describe.

3.1.3.3 Have you imported any new instruments or attachments for ambient air? Yes ____ No __x__.

If yes, please describe.

3.1.3.4 Are you obtaining information on sampling, test procedure or instrumentation for ambient air from outside Canada? Yes ____ No __x__

If yes, what sort of information and from whom?

3.1.3.5 Are you participating in an information exchange with persons outside Canada on asbestos fibre measurements or identification in ambient air?

Yes ____ No _x_

If yes, what sort of information are you exchanging, with whom and on what basis? (through an organization (name?), personal contact, etc.).

3.1.4. How much service work is actually done there on asbestos fibre in air?

3.1.4.1 Samples air: 2/month
bulk: 4/month

3.1.4.2 Dollar Value: $16,000/year

3.1.4.3 What is the source of funds for this work?

Fee for Service: Ontario Hydro, CGE, U. of Toronto, Toronto Hydro, etc.

3.1.5 How long has your laboratory been doing service work in asbestos fibre measurement or identification in air? _1_ years.

3.1.6 What future plans do you have for the service work in asbestos fibre measurement and identification in air? (include possible changes in method and equipment).

To continue in present manner.

3.2 Presumably the proportion of your activity in fibre measurement and identification which is not service work, is research. Is this a correct assumption?

No _____. Please explain.

No research.

Yes ____. Continue through 3.2.1.

3.2.1 What research projects are underway on asbestos fibre measurement or identification in air?

3.2.1.1 On sampling?

3.2.1.2 On test procedures?

3.2.1.3 On instrumentation?

3.2.2 How much research work is actually done there on asbestos fibre measurement or identification in air?

3.2.2.1 Man-hours/week: ________

3.2.2.2 Dollar Value: ________

3.2.2.3 What is the source of funds for this work?

3.2.3 Have you imported any specialty instruments or attachments for your research work on asbestos fibre in air?

Yes _____ No _____

If yes, please describe.

3.2.4 Are you obtaining information or participating in an information exchange on research into the measurement or identification of asbestos fibres in air with persons outside Canada?

Yes _____ No _____

If yes, what sort of information are you obtaining or exchanging, with whom and on what basis? (through an organization (name?) personal contact, etc.).

3.2.5 What past research work has your laboratory done on asbestos fibre measurement or identification in air?

3.2.5.1 On sampling?

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3.2.5.2 On test procedures?

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3.2.5.3 On instrumentation?

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3.2.6 How long has your laboratory been doing research work on asbestos fibre measurement or identification in air?

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3.2.7 What future research work is planned on asbestos fibre measurement or identification in air?

3.2.7.1 On sampling?

3.2.7.2 On test procedure?

3.2.7.3 On instrumentation?

4. Are you measuring or identifying asbestos fibres in water?

No _x_ Jump to Section 5.

Yes _____ What percentage of your work is measurement or identification in water as opposed to other media? _____%.

4.1 What percentage of your work on asbestos fibre measurement or identification in water is service work as opposed to research? _____%.

4.1.1 What general procedures do you use for asbestos fibre measurements or identification in water? (include sampling, test procedures and instrumentation).

4.1.1.1 What modifications have you made in these procedures?

4.1.1.2 Have you developed any new instruments or attachments in your laboratory for use in water measurement or identification? Yes ____ No ____

If yes, please describe? ________________________

4.1.1.3 Have you imported any new instruments or attachments for use in water measurement or identification?

Yes ____ No ____

If yes, please describe?

4.1.1.4 Are you obtaining information on sampling, test procedure or instrumentation for measurement or identification of asbestos fibre in water from outside Canada?

Yes ____ No ____

If yes, what sort of information and from whom?

4.1.1.4 (Continued) If yes, what sort of information and from whom?

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4.1.1.5 Are you participating in an information exchange with persons outside Canada on asbestos fibre measurement or identification in water?

Yes____ No _____

If yes, what sort of information are you exchanging, with whom and on what basis? (through an organization (name), personal contact, etc.).

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4.1.2 How much service work is actually done there on the measurement and identification of asbestos fibres in water?

4.1.2.1 Man-hours/Week: ________

4.1.2.2 Dollar Value:

4.1.2.3 What is the source of funds for this work?

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4.1.4 What are your future plans for asbestos fibre measurement and identification in water? (include possible changes in method and equipment.

4.2 Presumably, that proportion of your activity in asbestos fibre measurements or identification which is not service work, is research. Is this a correct assumption?

No _____ Please explain.

Yes ____ Continue through 4.2.1.

4.2.1 What research projects are underway on asbestos fibre measurement or identification in water?

4.2.1.1 On Sampling? ______________________________

4.2.1.2 On test procedures?

4.2.1.3 On instrumentation?

4.2.2 How much research is actually done there on the measurement or identification of asbestos fibres in water?

4.2.2.1 Man-hours/week:
4.2.2.2 Dollar Value:

4.2.2.3 What is the source of funds for this work?

4.2.3 Have you imported any new instruments or attachments for your research work on asbestos fibre in water?

Yes ______ No ______

If yes, please describe.

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4.2.4 Are you obtaining information or participating in an information exchange on research into the measurement or identification of asbestos fibres in water with persons outside Canada?

Yes ______ No ______

If yes, what sort of information are you obtaining or exchanging, with whom and on what basis? (through an organization (name?) personal contact, etc.).

____

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4.2.5 What past research work has your laboratory done on asbestos fibre measurement or identification in water?

4.2.5.1 On sampling?

4.2.5.2 On test procedures?

4.2.5.3 On instrumentation?

4.2.6 How long has your laboratory been doing research work on asbestos fibre measurement or identification in water?

4.2.7 What future research work is planned on asbestos fibre measurement or identification in water?

4.2.7.1 On sampling? ____________

4.2.7.2 On test procedure? ____________

4.2.7.3 On instrumentation? ____________

5. Have you done any asbestos fibre identification in biological samples?

Yes _____ No __x__

If yes, on what samples and under what circumstances?

5.1 What procedures are you using on biological samples?

5.1.1 What modifications have you made in these procedures?

6. Have you done any asbestos fibre measurement or identification in media other than air, water or biological specimens?

Yes x NO

If yes, on what materials and under what circumstances?

Bulk samples, mostly insulation.

6.1 What procedures do you use?

Beginning to do work with I.R., otherwise optical examination.

6.1.1 What modifications have you made in these procedures?

7. Who else do you know in Canada is working on inorganic fibre measurement or identification?

- Ontario Research Foundation
- U. of T. Chemical Engineering Faculty are doing some counting, mostly on university buildings (Prof. Jim Smith).

8. What areas of research do you think deserve further work?

A system of interlaboratory counting comparisons should be available on a routine basis.

Interviewer: W.D. Brown Date: November 28/80

Q-21

ASBESTOS FIBRE MEASUREMENT SURVEY

My name is Doug Brown of the Ontario Research Foundation. We are doing a cross-Canada survey for Energy, Mines and Resources Canada to determine what work is being done on the measurement of inorganic fibres, particularly asbestos, in air and in water. This is needed for Energy, Mines and Resources own information and for the international technical co-operation program operated through the European Economic Community. Thus the information obtained in the survey will become public property.

Are you willing to spend a few minutes answering questions on your work in the area?

Name of Company University of Waterloo
Address
Telephone No. (519) 885-1211 Ext. 3336 and 3625
Name of Interviewee Dr. Gordon Bragg
Position Professor, Dept. of Mechanical Engineering

1. Is work being done there on fibre measurement or identification?
   - No x Terminate interview.
   - Yes ____ Continue with 2. See Research Section 3.2.

2. What types of fibres are you measuring or identifying?
   - 2.1 Asbestos? Yes ____ No ____
   - 2.1.1 If yes, what kinds of asbestos?
     - Chrysotile
     - Amosite
     - Crocidolite
     - Anthophylite
     - Tremolite
     - Actinolite
   - 2.2 Other fibres? Yes ____ No ____

2.2.1 If yes, what kinds of fibres?

____

____

____

____

____

(In this questionnaire we refer specifically to asbestos fibres, as our major area of interest. However, we would also like to hear about any other inorganic fibres you may be working with).

____

____

____

____

3. Are you measuring or identifying asbestos fibres in air?

No ____ Jump to Section 4.

Yes ___ What percentage of your work is measurement or identification in air as opposed to other media? ____%.

3.1 What percentage of your work on air measurements is service work as opposed to research? ________%

3.1.1 What percentage of your service work is on air from the work place as opposed to ambient air? _______%

3.1.1.1 What percentage of your air measurements from the work place is personal as opposed to static? ____%.

3.1.2. What general procedures do you use in your service work on air from the work place? (Include sampling, test procedure and instrumentation).

3.1.2.1 What modifications have you made in these procedures?

3.1.2.2 Have you developed any new instruments in your laboratory for use on air from the work place?

Yes _____ No _____

If yes, please describe.

3.1.2.3 Have you imported any new instruments or attachments for use on air from the work place? Yes____ No ____

If yes, please describe.

3.1.2.4 Are you obtaining information on sampling, test procedure, or instrumentation from outside Canada?

Yes _____ No _____

If yes, what sort of information and from whom?

3.1.2.5 Are you participating in an information exchange with persons outside Canada? Yes _____ No _____.

If yes, what sort of information are you exchanging, with whom, and on what basis? (through an organization (name?), personal contact, etc.).

3.1.3 What general procedures are you using on ambient air? (include sampling, test procedure and instrumentation).

3.1.3.1 What modifications have you made in these procedures?

3.1.3.2 Have you developed any new instruments or attachments for ambient air in your laboratory? Yes ____ No ____
If yes, please describe.

3.1.3.3 Have you imported any new instruments or attachments for ambient air? Yes ____ No ____.

If yes, please describe.

3.1.3.4 Are you obtaining information on sampling, test procedure or instrumentation for ambient air from outside Canada? Yes ____ No ____

If yes, what sort of information and from whom?

3.1.3.5 Are you participating in an information exchange with persons outside Canada on asbestos fibre measurements or identification in ambient air?

Yes ____ No ____

If yes, what sort of information are you exchanging, with whom and on what basis? (through an organization (name?), personal contact, etc.).

3.1.4 How much service work is actually done there on asbestos fibre in air?

3.1.4.1 Samples/Day: ____________

3.1.4.2 Dollar Value: ____________

3.1.4.3 What is the source of funds for this work?

3.1.5 How long has your laboratory been doing service work in asbestos fibre measurement or identification in air? ____ years.

3.1.6 What future plans do you have for the service work in asbestos fibre measurement and identification in air? (include possible changes in method and equipment).

3.2 Presumably the proportion of your activity in fibre measurement and identification which is not service work, is research. Is this a correct assumption?

No _____. Please explain.

Yes _x_. Continue through 3.2.1.

3.2.1 What research projects are underway on asbestos fibre measurement or identification in air?

3.2.1.1 On sampling?

None at present

3.2.1.2 On test procedures?

None at present

3.2.1.3 On instrumentation?

None at present

3.2.2 How much research work is actually done there on asbestos fibre measurement or identification in air?

3.2.2.1 Man-hours/week: ________ None at present

3.2.2.2 Dollar Value: ________

3.2.2.3 What is the source of funds for this work?

3.2.3 Have you imported any specialty instruments or attachments for your research work on asbestos fibre in air?

Yes __x__ No _____

If yes, please describe.

Have done so in past

monodispense aerosol generator

automatic particle counter

3.2.4 Are you obtaining information or participating in an information exchange on research into the measurement or identification of asbestos fibres in air with persons outside Canada?

Yes __x__ No _____

If yes, what sort of information are you obtaining or exchanging, with whom and on what basis? (through an organization (name?) personal contact, etc.).

International conferences:

NIOSH, OSHA

literature on the topic.

3.2.5 What past research work has your laboratory done on asbestos fibre measurement or identification in air?

3.2.5.1 On sampling?

see below

3.2.5.2 On test procedures?

- Reproducibility of counting
- procedures
- In-plant variation in counts
- statistical analysis of the geometry of fibres

3.2.5.3 On instrumentation?

- Use of SEM for counting and comparison with optical method
- Wrote a book with G. Rajhans: "Engineering Aspects of Asbestos Dust Control"
- Development of acoustical-based fibre sampling system.

3.2.6 How long has your laboratory been doing research work on asbestos fibre measurement or identification in air?

7 - 8 years

3.2.7 What future research work is planned on asbestos fibre measurement or identification in air?

Some work on ducting and collecting systems for dust.

3.2.7.1 On sampling?

see below

3.2.7.2 On test procedure?

Methodology in connection with acoustical -based particle size analyzer.

3.2.7.3 On instrumentation?

Development of the acoustical -based particle size analyzer.

4. Are you measuring or identifying asbestos fibres in water?

No _____ Jump to Section 5.

Yes _____ What percentage of your work is measurement or identification in water as opposed to other media? _____%.

4.1 What percentage of your work on asbestos fibre measurement or identification in water is service work as opposed to research? _____%.

4.1.1 What general procedures do you use for asbestos fibre measurements or identification in water? (include sampling, test procedures and instrumentation).

4.1.1.1 What modifications have you made in these procedures?

4.1.1.2 Have you developed any new instruments or attachments in your laboratory for use in water measurement or identification? Yes ____ No ____

If yes, please describe? ____________________

4.1.1.3 Have you imported any new instruments or attachments for use in water measurement or identification?

Yes ____ No ____

If yes, please describe?

4.1.1.4 Are you obtaining information on sampling, test procedure or instrumentation for measurement or identification of asbestos fibre in water from outside Canada?

Yes ____ No ____

If yes, what sort of information and from whom?

4.1.1.4 (Continued) If yes, what sort of information and from whom?

4.1.1.5 Are you participating in an information exchange with persons outside Canada on asbestos fibre measurement or identification in water?

Yes____ No _____

If yes, what sort of information are you exchanging, with whom and on what basis? (through an organization (name), personal contact, etc.).

4.1.2 How much service work is actually done there on the measurement and identification of asbestos fibres in water?

4.1.2.1 Man-hours/Week: ________

4.1.2.2 Dollar Value:

4.1.2.3 What is the source of funds for this work?

4.1.4 What are your future plans for asbestos fibre measurement and identification in water? (include possible changes in method and equipment.

4.2 Presumably, that proportion of your activity in asbestos fibre measurements or identification which is not service work, is research. Is this a correct assumption?

No _____ Please explain.

Yes ____ Continue through 4.2.1.

4.2.1 What research projects are underway on asbestos fibre measurement or identification in water?

4.2.1.1 On Sampling? ____________________

4.2.1.2 On test procedures?

4.2.1.3 On instrumentation?

4.2.2 How much research is actually done there on the measurement or identification of asbestos fibres in water?

4.2.2.1 Man-hours/week:
4.2.2.2 Dollar Value:

4.2.2.3 What is the source of funds for this work?

4.2.3 Have you imported any new instruments or attachments for your research work on asbestos fibre in water?

Yes ______ No ______

If yes, please describe.

4.2.4 Are you obtaining information or participating in an information exchange on research into the measurement or identification of asbestos fibres in water with persons outside Canada?

Yes ______ No ______

If yes, what sort of information are you obtaining or exchanging, with whom and on what basis? (through an organization (name?) personal contact, etc.).

4.2.5 What past research work has your laboratory done on asbestos fibre measurement or identification in water?

4.2.5.1 On sampling?______________________________

4.2.5.2 On test procedures? ______________________________

4.2.5.3 On instrumentation? ______________________________

4.2.6 How long has your laboratory been doing research work on asbestos fibre measurement or identification in water?____________________

4.2.7 What future research work is planned on asbestos fibre measurement or identification in water?

4.2.7.1 On sampling? ______________________

4.2.7.2 On test procedure? ______________________

4.2.7.3 On instrumentation? ______________________

5. Have you done any asbestos fibre identification in biological samples?

Yes _____ No _____

If yes, on what samples and under what circumstances?

5.1 What procedures are you using on biological samples?

5.1.1 What modifications have you made in these procedures?

6. Have you done any asbestos fibre measurement or identification in media other than air, water or biological specimens?

Yes _____ NO _____

If yes, on what materials and under what circumstances?

6.1 What procedures do you use?

6.1.1 What modifications have you made in these procedures?

7. Who else do you know in Canada is working on inorganic fibre measurement or identification?

Interviewer: W.D. Brown Date: 10/11/80

Q-22

ASBESTOS FIBRE MEASUREMENT SURVEY

My name is Doug Brown of the Ontario Research Foundation. We are doing a cross-Canada survey for Energy, Mines and Resources Canada to determine what work is being done on the measurement of inorganic fibres, particularly asbestos, in air and in water. This is needed for Energy, Mines and Resources own information and for the international technical co-operation program operated through the European Economic Community. Thus the information obtained in the survey will become public property.

Are you willing to spend a few minutes answering questions on your work in the area?

Name of Company University of Waterloo
Address
Telephone No. (519) 885-1211, Ext. 2865
Name of Interviewee Mr. Peter Pityn, Assistant Director
Position Centre for Occupational Health & Safety
(Dr. T.M. Fraser, Director).

1. Is work being done there on fibre measurement or identification?
   No ____ Terminate interview.
   Yes x Continue with 2.

2. What types of fibres are you measuring or identifying?
   2.1 Asbestos? Yes x No ____
   2.1.1 If yes, what kinds of asbestos?
      Chrysotile x
      Amosite x
      Crocidolite x
      Anthophylite
      Tremolite
      Actinolite
   2.2 Other fibres? Yes ____ No x

2.2.1 If yes, what kinds of fibres?

(In this questionnaire we refer specifically to asbestos fibres, as our major area of interest. However, we would also like to hear about any other inorganic fibres you may be working with).

3. Are you measuring or identifying asbestos fibres in air?

No ____ Jump to Section 4.

Yes x What percentage of your work is measurement or identification in air as opposed to other media? 95 %.

3.1 What percentage of your work on air measurements is service work as opposed to research? 98 %

3.1.1 What percentage of your service work is on air from the work place as opposed to ambient air? 100 %

3.1.1.1 What percentage of your air measurements from the work place is personal as opposed to static? ? %.

3.1.2. What general procedures do you use in your service work on air from the work place? (Include sampling, test procedure and instrumentation).

NIOSH Method

3.1.2.1 What modifications have you made in these procedures?

None.

3.1.2.2 Have you developed any new instruments in your laboratory for use on air from the work place?

Yes _____ No _x__

If yes, please describe.

3.1.2.3 Have you imported any new instruments or attachments for use on air from the work place? Yes____ No _x__

If yes, please describe.

3.1.2.4 Are you obtaining information on sampling, test procedure, or instrumentation from outside Canada?

Yes x No _____

If yes, what sort of information and from whom?

General literature and equipment manufacturers

3.1.2.5 Are you participating in an information exchange with persons outside Canada? Yes _____ No x .

If yes, what sort of information are you exchanging, with whom, and on what basis? (through an organization (name?), personal contact, etc.).

3.1.3 What general procedures are you using on ambient air? (include sampling, test procedure and instrumentation).

3.1.3.1 What modifications have you made in these procedures?

3.1.3.2 Have you developed any new instruments or attachments for ambient air in your laboratory? Yes ____ No ____
If yes, please describe.

3.1.3.3 Have you imported any new instruments or attachments for ambient air? Yes ____ No ____.

If yes, please describe.

3.1.3.4 Are you obtaining information on sampling, test procedure or instrumentation for ambient air from outside Canada? Yes ____ No ____

If yes, what sort of information and from whom?

3.1.3.5 Are you participating in an information exchange with persons outside Canada on asbestos fibre measurements or identification in ambient air?

Yes ____ No ____

If yes, what sort of information are you exchanging, with whom and on what basis? (through an organization (name?), personal contact, etc.).

3.1.4 How much service work is actually done there on asbestos fibre in air?

3.1.4.1 Samples/Day: Very Sporadic - impossible to estimate

3.1.4.2 Dollar Value: ____

3.1.4.3 What is the source of funds for this work?

Fee for service: industrial clients.

3.1.5 How long has your laboratory been doing service work in asbestos fibre measurement or identification in air? 2 years.

3.1.6 What future plans do you have for the service work in asbestos fibre measurement and identification in air? (include possible changes in method and equipment).

Continue to provide service.

3.2 Presumably the proportion of your activity in fibre measurement and identification which is not service work, is research. Is this a correct assumption?

No _____. Please explain.

Yes x . Continue through 3.2.1.

3.2.1 What research projects are underway on asbestos fibre measurement or identification in air?

3.2.1.1 On sampling?

Literature reviews and improvements in sampling and measurement procedures including automated instrumentation.

3.2.1.2 On test procedures?

As above.

3.2.1.3 On instrumentation?

As above.

3.2.2 How much research work is actually done there on asbestos fibre measurement or identification in air?

3.2.2.1 Man-hours/week: Impossible to estimate.

3.2.2.2 Dollar Value: ________

3.2.2.3 What is the source of funds for this work?

3.2.3 Have you imported any specialty instruments or attachments for your research work on asbestos fibre in air?

Yes _____ No __x__

If yes, please describe.

3.2.4 Are you obtaining information or participating in an information exchange on research into the measurement or identification of asbestos fibres in air with persons outside Canada?

Yes __x__ No _____

If yes, what sort of information are you obtaining or exchanging, with whom and on what basis? (through an organization (name?) personal contact, etc.).

General literature and from the equipment manufacturers.

3.2.5 What past research work has your laboratory done on asbestos fibre measurement or identification in air?

3.2.5.1 On sampling?

Ongoing project for past six months as under 3.2.4

3.2.5.2 On test procedures?

As above.

3.2.5.3 On instrumentation?

As above.

3.2.6 How long has your laboratory been doing research work on asbestos fibre measurement or identification in air?

About 6 months.

3.2.7 What future research work is planned on asbestos fibre measurement or identification in air?

Program is not as yet established.

3.2.7.1 On sampling?

3.2.7.2 On test procedure?

3.2.7.3 On instrumentation?

4. Are you measuring or identifying asbestos fibres in water?

No __x__ Jump to Section 5.

Yes _____ What percentage of your work is measurement or identification in water as opposed to other media? _____%.

4.1 What percentage of your work on asbestos fibre measurement or identification in water is service work as opposed to research?

_____%.

4.1.1 What general procedures do you use for asbestos fibre measurements or identification in water? (include sampling, test procedures and instrumentation).

4.1.1.1 What modifications have you made in these procedures?

4.1.1.2 Have you developed any new instruments or attachments in your laboratory for use in water measurement or identification? Yes ____ No ____

If yes, please describe? ____________________

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4.1.1.3 Have you imported any new instruments or attachments for use in water measurement or identification?

Yes ____ No ____

If yes, please describe?

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4.1.1.4 Are you obtaining information on sampling, test procedure or instrumentation for measurement or identification of asbestos fibre in water from outside Canada?

Yes ____ No ____

If yes, what sort of information and from whom?

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4.1.1.4 (Continued) If yes, what sort of information and from whom?

4.1.1.5 Are you participating in an information exchange with persons outside Canada on asbestos fibre measurement or identification in water?

Yes____ No _____

If yes, what sort of information are you exchanging, with whom and on what basis? (through an organization (name), personal contact, etc.).

4.1.2 How much service work is actually done there on the measurement and identification of asbestos fibres in water?

4.1.2.1 Man-hours/Week: ________

4.1.2.2 Dollar Value:

4.1.2.3 What is the source of funds for this work?

4.1.4 What are your future plans for asbestos fibre measurement and identification in water? (include possible changes in method and equipment.

4.2 Presumably, that proportion of your activity in asbestos fibre measurements or identification which is not service work, is research. Is this a correct assumption?

No _____ Please explain.

Yes ____ Continue through 4.2.1.

4.2.1 What research projects are underway on asbestos fibre measurement or identification in water?

4.2.1.1 On Sampling? ______________________________

4.2.1.2 On test procedures?

4.2.1.3 On instrumentation?

4.2.2 How much research is actually done there on the measurement or identification of asbestos fibres in water?

4.2.2.1 Man-hours/week:
4.2.2.2 Dollar Value:

4.2.2.3 What is the source of funds for this work?

4.2.3 Have you imported any new instruments or attachments for your research work on asbestos fibre in water?

Yes ______ No _______

If yes, please describe.

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4.2.4 Are you obtaining information or participating in an information exchange on research into the measurement or identification of asbestos fibres in water with persons outside Canada?

Yes _______ No _______

If yes, what sort of information are you obtaining or exchanging, with whom and on what basis? (through an organization (name?) personal contact, etc.).

____

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4.2.5 What past research work has your laboratory done on asbestos fibre measurement or identification in water?

4.2.5.1 On sampling?

4.2.5.2 On test procedures?

4.2.5.3 On instrumentation?

4.2.6 How long has your laboratory been doing research work on asbestos fibre measurement or identification in water?

4.2.7 What future research work is planned on asbestos fibre measurement or identification in water?

4.2.7.1 On sampling? ____________________

4.2.7.2 On test procedure? ____________________

4.2.7.3 On instrumentation? ____________________

5. Have you done any asbestos fibre identification in biological samples?

Yes _____ No x_____

If yes, on what samples and under what circumstances?

5.1 What procedures are you using on biological samples?

5.1.1 What modifications have you made in these procedures?

6. Have you done any asbestos fibre measurement or identification in media other than air, water or biological specimens?

Yes ____ NO x

If yes, on what materials and under what circumstances?

6.1 What procedures do you use?

6.1.1 What modifications have you made in these procedures?

7. Who else do you know in Canada is working on inorganic fibre measurement or identification?

Ontario Ministry of Labour

Universities

Ontario Research Foundation

8. What areas of research do you think deserve further work?

Air sampling techniques and analytical techniques should be improved.

Physiological studies should be undertaken to determine whether there is any threshold limit.

Look at other subjective means of evaluating exposure hazard such as the Ferris Index.

International exchange of information, techniques and actual samples for round-robin tests.

Interviewer: W.D. Brown Date: 25 Nov. 80

Q-23

ASBESTOS FIBRE MEASUREMENT SURVEY

My name is Doug Brown of the Ontario Research Foundation. We are doing a cross-Canada survey for Energy, Mines and Resources Canada to determine what work is being done on the measurement of inorganic fibres, particularly asbestos, in air and in water. This is needed for Energy, Mines and Resources own information and for the international technical co-operation program operated through the European Economic Community. Thus the information obtained in the survey will become public property.

Are you willing to spend a few minutes answering questions on your work in the area?

Name of Company University of Western Ontario
Address Occupational Health and Safety Resources Centre
Telephone No. (519) 679-3305
Name of Interviewee Mr. B.S. Cheung and Dr. Ernest Sullivan
Position Mr. Cheung is Chief of Laboratories.

1. Is work being done there on fibre measurement or identification?
   No ____ Terminate interview.
   Yes x Continue with 2.

2. What types of fibres are you measuring or identifying?
   2.1 Asbestos? Yes x No ____
   2.1.1 If yes, what kinds of asbestos?
   - Chrysotile x
   - Amosite x
   - Crocidolite x
   - Anthophylite x
   - Tremolite x
   - Actinolite x

   2.2 Other fibres? Yes ____ No x

2.2.1 If yes, what kinds of fibres?

____

____

____

____

____

(In this questionnaire we refer specifically to asbestos fibres, as our major area of interest. However, we would also like to hear about any other inorganic fibres you may be working with).

____

____

____

____

3. Are you measuring or identifying asbestos fibres in air?

No ____ Jump to Section 4.

Yes x What percentage of your work is measurement or identification in air as opposed to other media? 20 %.

3.1 What percentage of your work on air measurements is service work as opposed to research? 100 %

3.1.1 What percentage of your service work is on air from the work place as opposed to ambient air? 10 %

3.1.1.1 What percentage of your air measurements from the work place is personal as opposed to static? <10 %.

3.1.2. What general procedures do you use in your service work on air from the work place? (Include sampling, test procedure and instrumentation).

NIOSH 2

3.1.2.1 What modifications have you made in these procedures?

None

3.1.2.2 Have you developed any new instruments in your laboratory for use on air from the work place?

Yes _____ No __x__

If yes, please describe.

3.1.2.3 Have you imported any new instruments or attachments for use on air from the work place? Yes __x__ No _____

If yes, please describe.

Thermal precipitator from England for sampling.

3.1.2.4 Are you obtaining information on sampling, test procedure, or instrumentation from outside Canada?

Yes ×   No ____

If yes, what sort of information and from whom?

From literature and instrument companies, AIHA , conferences.

3.1.2.5 Are you participating in an information exchange with persons outside Canada? Yes ×   No ____.

If yes, what sort of information are you exchanging, with whom, and on what basis? (through an organization (name?), personal contact, etc.).

Indirectly through AIHA.

3.1.3 What general procedures are you using on ambient air? (include sampling, test procedure and instrumentation).

NIOSH 2 for sampling) depending on client
EPA for sampling)

NIOSH for phase contrast
modified EPA (Ministry of the Environment procedure)

3.1.3.1 What modifications have you made in these procedures?

Slight changes in personal technique for slide preparations.

3.1.3.2 Have you developed any new instruments or attachments for ambient air in your laboratory? Yes ____ No x
If yes, please describe.

3.1.3.3 Have you imported any new instruments or attachments for ambient air? Yes ____ No _x_.

If yes, please describe.

3.1.3.4 Are you obtaining information on sampling, test procedure or instrumentation for ambient air from outside Canada? Yes _x_ No ____

If yes, what sort of information and from whom?

From the literature and from instrument companies, AIHA, conferences.

3.1.3.5 Are you participating in an information exchange with persons outside Canada on asbestos fibre measurements or identification in ambient air?

Yes _x_ No ____

If yes, what sort of information are you exchanging, with whom and on what basis? (through an organization (name?), personal contact, etc.).

Indirectly through AIHA.

3.1.4 How much service work is actually done there on asbestos fibre in air?

3.1.4.1 Samples/~~Day~~ Month: __10__

3.1.4.2 Dollar Value: __$250 - 300/ week__

3.1.4.3 What is the source of funds for this work?

Clients, mostly consulting engineers.

3.1.5 How long has your laboratory been doing service work in asbestos fibre measurement or identification in air? __2½__years.

3.1.6 What future plans do you have for the service work in asbestos fibre measurement and identification in air? (include possible changes in method and equipment).

Hope to expand eventually.

3.2 Presumably the proportion of your activity in fibre measurement and identification which is not service work, is research. Is this a correct assumption?

No _____. Please explain.

Yes x___. Continue through 3.2.1.

3.2.1 What research projects are underway on asbestos fibre measurement or identification in air?

3.2.1.1 On sampling?

None

3.2.1.2 On test procedures?

Comparing NIOSH method with modified EPA method.

3.2.1.3 On instrumentation?

Thermal precipitator:
attempting to increase flow rate and reduce bulk of
the instrument. Preliminary study has been carried out.

3.2.2 How much research work is actually done there on asbestos fibre measurement or identification in air?

3.2.2.1 Man-hours/week: 2
3.2.2.2 Dollar Value: ________

3.2.2.3 What is the source of funds for this work?

No funding at moment.

3.2.3 Have you imported any specialty instruments or attachments for your research work on asbestos fibre in air?

Yes x No ____

If yes, please describe.

Thermal preicipitator from England (Cassella)

3.2.4 Are you obtaining information or participating in an information exchange on research into the measurement or identification of asbestos fibres in air with persons outside Canada?

Yes x No ____

If yes, what sort of information are you obtaining or exchanging, with whom and on what basis? (through an organization (name?) personal contact, etc.).

Only through literature.

3.2.5 What past research work has your laboratory done on asbestos fibre measurement or identification in air?

3.2.5.1 On sampling?

None

3.2.5.2 On test procedures?

None

3.2.5.3 On instrumentation?

None

3.2.6 How long has your laboratory been doing research work on asbestos fibre measurement or identification in air?

2½ years

3.2.7 What future research work is planned on asbestos fibre measurement or identification in air?

3.2.7.1 On sampling?

None

3.2.7.2 On test procedure?

Improved counting technique program for MInistry of Labour.

3.2.7.3 On instrumentation?

None

4. Are you measuring or identifying asbestos fibres in water?

No __x__ Jump to Section 5.

Yes _____ What percentage of your work is measurement or identification in water as opposed to other media? _____%.

4.1 What percentage of your work on asbestos fibre measurement or identification in water is service work as opposed to research? _____%.

4.1.1 What general procedures do you use for asbestos fibre measurements or identification in water? (include sampling, test procedures and instrumentation).

4.1.1.1 What modifications have you made in these procedures?

4.1.1.2 Have you developed any new instruments or attachments in your laboratory for use in water measurement or identification? Yes ____ No ____

If yes, please describe? ____________________

4.1.1.3 Have you imported any new instruments or attachments for use in water measurement or identification?

Yes ____ No ____

If yes, please describe?

4.1.1.4 Are you obtaining information on sampling, test procedure or instrumentation for measurement or identification of asbestos fibre in water from outside Canada?

Yes ____ No ____

If yes, what sort of information and from whom?

4.1.1.4 (Continued) If yes, what sort of information and from whom?

4.1.1.5 Are you participating in an information exchange with persons outside Canada on asbestos fibre measurement or identification in water?

Yes____ No _____

If yes, what sort of information are you exchanging, with whom and on what basis? (through an organization (name), personal contact, etc.).

4.1.2 How much service work is actually done there on the measurement and identification of asbestos fibres in water?

4.1.2.1 Man-hours/Week: _______

4.1.2.2 Dollar Value:

4.1.2.3 What is the source of funds for this work?

4.1.4 What are your future plans for asbestos fibre measurement and identification in water? (include possible changes in method and equipment.

4.2 Presumably, that proportion of your activity in asbestos fibre measurements or identification which is not service work, is research. Is this a correct assumption?

No _____ Please explain.

Yes ____ Continue through 4.2.1.

4.2.1 What research projects are underway on asbestos fibre measurement or identification in water?

4.2.1.1 On Sampling? ______________________________

4.2.1.2 On test procedures?

4.2.1.3 On instrumentation?

4.2.2 How much research is actually done there on the measurement or identification of asbestos fibres in water?

4.2.2.1 Man-hours/week:
4.2.2.2 Dollar Value:

4.2.2.3 What is the source of funds for this work?

4.2.3 Have you imported any new instruments or attachments for your research work on asbestos fibre in water?

Yes ______ No ______

If yes, please describe.

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____

4.2.4 Are you obtaining information or participating in an information exchange on research into the measurement or identification of asbestos fibres in water with persons outside Canada?

Yes ______ No ______

If yes, what sort of information are you obtaining or exchanging, with whom and on what basis? (through an organization (name?) personal contact, etc.).

____
____
____
____
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____
____

4.2.5 What past research work has your laboratory done on asbestos fibre measurement or identification in water?

4.2.5.1 On sampling?

4.2.5.2 On test procedures?

4.2.5.3 On instrumentation?

4.2.6 How long has your laboratory been doing research work on asbestos fibre measurement or identification in water?

4.2.7 What future research work is planned on asbestos fibre measurement or identification in water?

4.2.7.1 On sampling?

4.2.7.2 On test procedure?

4.2.7.3 On instrumentation?

5. Have you done any asbestos fibre identification in biological samples?

Yes _____ No x

If yes, on what samples and under what circumstances?

5.1 What procedures are you using on biological samples?

5.1.1 What modifications have you made in these procedures?

6. Have you done any asbestos fibre measurement or identification in media other than air, water or biological specimens?

Yes x NO

If yes, on what materials and under what circumstances?

Insulations, such as pipe wrappings and boiler and spray-on insulations.

6.1 What procedures do you use?

Polarized light microscopy
X-ray diffraction
EDAX (Energy Dispersive Analysis of X-rays)

6.1.1 What modifications have you made in these procedures?

None

7. Who else do you know in Canada is working on inorganic fibre measurement or identification?

ORF
Occupational Health Centres
Ministry of the Environment
Ministry of Labour

8. What areas of research do you think deserve further work?

Microscopes from which one can set diffraction patterns more readily.

Interviewer: W.D. Brown Date: November 11, 1980

Q-24

ASBESTOS FIBRE MEASUREMENT SURVEY

My name is Doug Brown of the Ontario Research Foundation. We are doing a cross-Canada survey for Energy, Mines and Resources Canada to determine what work is being done on the measurement of inorganic fibres, particularly asbestos, in air and in water. This is needed for Energy, Mines and Resources own information and for the international technical co-operation program operated through the European Economic Community. Thus the information obtained in the survey will become public property.

Are you willing to spend a few minutes answering questions on your work in the area?

Name of Company Ontario Research Foundation
Address Mississauga, Ontario L5K 1B3
Telephone No. 822-4111
Name of Interviewee Dr. Eric Chatfield
Position Assistant Director, Applied Physics Dept.

1. Is work being done there on fibre measurement or identification?
   No ____ Terminate interview.
   Yes x Continue with 2.

2. What types of fibres are you measuring or identifying?
   2.1 Asbestos? Yes x No ____
   2.1.1 If yes, what kinds of asbestos?
      Chrysotile x
      Amosite x
      Crocidolite x
      Anthophylite x
      Tremolite x
      Actinolite x
   2.2 Other fibres? Yes x No ____

2.2.1 If yes, what kinds of fibres?

glass, potassium titanate, wollastonite

(In this questionnaire we refer specifically to asbestos fibres, as our major area of interest. However, we would also like to hear about any other inorganic fibres you may be working with).

3. Are you measuring or identifying asbestos fibres in air?

No ____ Jump to Section 4.

Yes x What percentage of your work is measurement or identification in air as opposed to other media? 33 %.

3.1 What percentage of your work on air measurements is service work as opposed to research? 50 %

3.1.1 What percentage of your service work is on air from the work place as opposed to ambient air? <10 %

3.1.1.1 What percentage of your air measurements from the work place is personal as opposed to static? 0 %.

Probably all static

3.1.2. What general procedures do you use in your service work on air from the work place? (Include sampling, test procedure and instrumentation).

NIOSH techniques except for special applications.

3.1.2.1 What modifications have you made in these procedures?

Modifications are made depending on the circumstances: a lot of non-routine measurements are done here.

3.1.2.2 Have you developed any new instruments in your laboratory for use on air from the work place?

Yes _____ No _x___

If yes, please describe.

3.1.2.3 Have you imported any new instruments or attachments for use on air from the work place? Yes____ No _x_

If yes, please describe.

3.1.2.4 Are you obtaining information on sampling, test procedure, or instrumentation from outside Canada?

Yes _____ No __x__

If yes, what sort of information and from whom?

3.1.2.5 Are you participating in an information exchange with persons outside Canada? Yes __x__ No _____.

If yes, what sort of information are you exchanging, with whom, and on what basis? (through an organization (name?), personal contact, etc.).

Through ISO

3.1.3 What general procedures are you using on ambient air? (include sampling, test procedure and instrumentation).

Sampling on nuclipore membranes,

carbon- coated preparation and TEM analysis

3.1.3.1 What modifications have you made in these procedures?

Research programs are in progress.

3.1.3.2 Have you developed any new instruments or attachments for ambient air in your laboratory? Yes ____ No x____

If yes, please describe.

3.1.3.3 Have you imported any new instruments or attachments for ambient air? Yes ____ No x .

If yes, please describe.

3.1.3.4 Are you obtaining information on sampling, test procedure or instrumentation for ambient air from outside Canada?
Yes x No ____

If yes, what sort of information and from whom?

On sampling and test procedures

I am a reviewer of development contracts in progress for Illinois Institute of Technology

3.1.3.5 Are you participating in an information exchange with persons outside Canada on asbestos fibre measurements or identification in ambient air?

Yes x No ____

If yes, what sort of information are you exchanging, with whom and on what basis? (through an organization (name?), personal contact, etc.).

Through ISO

3.1.4 How much service work is actually done there on asbestos fibre in air?

3.1.4.1 Samples/Day: ____________

3.1.4.2 Dollar Value: $60,000 to $100,00 per year

3.1.4.3 What is the source of funds for this work?

Mainly U.S.funds

3.1.5 How long has your laboratory been doing service work in asbestos fibre measurement or identification in air? 10 years.

3.1.6 What future plans do you have for the service work in asbestos fibre measurement and identification in air? (include possible changes in method and equipment).

More instrumental development.

3.2 Presumably the proportion of your activity in fibre measurement and identification which is not service work, is research. Is this a correct assumption?

No _____. Please explain.

Yes x___. Continue through 3.2.1.

3.2.1 What research projects are underway on asbestos fibre measurement or identification in air?

3.2.1.1 On sampling?

One for Health and Welfare Canada

3.2.1.2 On test procedures?

SEM automatic fibre counting.

3.2.1.3 On instrumentation?

Development of a magnetic alignment technique.

3.2.2 How much research work is actually done there on asbestos fibre measurement or identification in air?

3.2.2.1 Man-hours/week: ________

3.2.2.2 Dollar Value: $200,000/year

3.2.2.3 What is the source of funds for this work?

Federal Government

3.2.3 Have you imported any specialty instruments or attachments for your research work on asbestos fibre in air?

Yes _____ No __x__

If yes, please describe.

3.2.4 Are you obtaining information or participating in an information exchange on research into the measurement or identification of asbestos fibres in air with persons outside Canada?

Yes __x__ No _____

If yes, what sort of information are you obtaining or exchanging, with whom and on what basis? (through an organization (name?) personal contact, etc.).

Through ISO

3.2.5 What past research work has your laboratory done on asbestos fibre measurement or identification in air?

3.2.5.1 On sampling?

None

3.2.5.2 On test procedures?

Identification and quantification by TEM

3.2.5.3 On instrumentation?

None

3.2.6 How long has your laboratory been doing research work on asbestos fibre measurement or identification in air?

10 years

3.2.7 What future research work is planned on asbestos fibre measurement or identification in air?

Continuation of the Federal Government contract currently in progress.

Limited internal funding on the comparison of test procedures.

3.2.7.1 On sampling?

3.2.7.2 On test procedure?

3.2.7.3 On instrumentation?

4. Are you measuring or identifying asbestos fibres in water?

No _____ Jump to Section 5.

Yes __×__ What percentage of your work is measurement or identification in water as opposed to other media? __80__ %.

4.1 What percentage of your work on asbestos fibre measurement or identification in water is service work as opposed to research? __25__ %.

4.1.1 What general procedures do you use for asbestos fibre measurements or identification in water? (include sampling, test procedures and instrumentation).

TEM method specified by EPA (U.S.)

4.1.1.1 What modifications have you made in these procedures?

We provide basic data for the EPA method.

4.1.1.2 Have you developed any new instruments or attachments in your laboratory for use in water measurement or identification? Yes ____ No __x__

If yes, please describe? ______

4.1.1.3 Have you imported any new instruments or attachments for use in water measurement or identification?

Yes ____ No __x__

If yes, please describe?

4.1.1.4 Are you obtaining information on sampling, test procedure or instrumentation for measurement or identification of asbestos fibre in water from outside Canada?

Yes ____ No __x__

If yes, what sort of information and from whom?

4.1.1.4 (Continued) If yes, what sort of information and from whom?

4.1.1.5 Are you participating in an information exchange with persons outside Canada on asbestos fibre measurement or identification in water?

Yes____ No _____

If yes, what sort of information are you exchanging, with whom and on what basis? (through an organization (name), personal contact, etc.).

Through ISO

4.1.2 How much service work is actually done there on the measurement and identification of asbestos fibres in water?

4.1.2.1 Man-hours/Week: ________

4.1.2.2 Dollar Value: $100,000/year

4.1.2.3 What is the source of funds for this work?

Mainly foreign

4.1.4 What are your future plans for asbestos fibre measurement and identification in water? (include possible changes in method and equipment. To do work on:

- New methods of oxidation of organics
- Selective concentration of asbestos fibres
- New methods not involving fibre counting
- More precise methods for fibre identification
- Statistics of fibre counting.

4.2 Presumably, that proportion of your activity in asbestos fibre measurements or identification which is not service work, is research. Is this a correct assumption?

No ____ Please explain.

Yes x Continue through 4.2.1.

4.2.1 What research projects are underway on asbestos fibre measurement or identification in water?

4.2.1.1 On Sampling?

Main EPA contract on fibre counting.

4.2.1.2 On test procedures?

4.2.1.3 On instrumentation?

4.2.2 How much research is actually done there on the measurement or identification of asbestos fibres in water?

4.2.2.1 Man-hours/week:
4.2.2.2 Dollar Value: $565,000 over 3 years

4.2.2.3 What is the source of funds for this work?

US EPA

4.2.3 Have you imported any new instruments or attachments for your research work on asbestos fibre in water?

Yes ______ No __x____

If yes, please describe.

4.2.4 Are you obtaining information or participating in an information exchange on research into the measurement or identification of asbestos fibres in water with persons outside Canada?

Yes _______ No ___x___

If yes, what sort of information are you obtaining or exchanging, with whom and on what basis? (through an organization (name?) personal contact, etc.).

4.2.5 What past research work has your laboratory done on asbestos fibre measurement or identification in water?

4.2.5.1 On sampling?

Canadian Government contract

U.S. EPA contract

4.2.5.2 On test procedures?

Canadian Government contract

U.S. EPA contract

4.2.5.3 On instrumentation?

4.2.6 How long has your laboratory been doing research work on asbestos fibre measurement or identification in water? 10 years

4.2.7 What future research work is planned on asbestos fibre measurement or identification in water?

4.2.7.1 On sampling?

Completion of current work on drinking water and possible extension to industrial effluents.

4.2.7.2 On test procedure?

Same as above

4.2.7.3 On instrumentation?

Same as above

5. Have you done any asbestos fibre identification in biological samples?

Yes x No ____

If yes, on what samples and under what circumstances?

Very limited - some biopsy samples from Toronto General Hospital

5.1 What procedures are you using on biological samples?

TEM

5.1.1 What modifications have you made in these procedures?

None

6. Have you done any asbestos fibre measurement or identification in media other than air, water or biological specimens?

Yes x NO ____

If yes, on what materials and under what circumstances?

Insulation, talc and vermiculite

6.1 What procedures do you use?

Insulation: polarized light microscopy
dispersion staining
SEM (EDXA)
Talc : TEM and ED including EDXA
Vermiculite: TEM and ED including EDXA

6.1.1 What modifications have you made in these procedures?

None

7. Who else do you know in Canada is working on inorganic fibre measurement or identification?

McGill University - Neil Rowlands
Ontario Ministry of Environment - Paul Robert
Ontario Ministry of Labour - Dr. Rajhans
Sherbrooke University - M. Cossette
Lakehead University - Dr. Mothersill
McMaster University - Dr. Kramer
Dept. of Health Canada - J.C. Meranger
Environment Canada - Lemmon

Interviewer: W.D. Brown Date: October 24, 1980

See appendix for areas deserving future work

APPENDIX

NOTES

Areas deserving future work:

1. air sampling techniques
2. criteria for fibre identification
3. criteria for fibre counting
4. development of and making available suitable standards

Q-25

ASBESTOS FIBRE MEASUREMENT SURVEY

My name is Doug Brown of the Ontario Research Foundation. We are doing a cross-Canada survey for Energy, Mines and Resources Canada to determine what work is being done on the measurement of inorganic fibres, particularly asbestos, in air and in water. This is needed for Energy, Mines and Resources own information and for the international technical co-operation program operated through the European Economic Community. Thus the information obtained in the survey will become public property.

Are you willing to spend a few minutes answering questions on your work in the area?

Name of Company Ontario Research Foundation
Address Sheridan Park, Mississauga, Ontario L5K 1B3
Telephone No. (416) 822-4111
Name of Interviewee Mrs. Jackie Terry
Position Technologist II, Image Analysis Laboratory

1. Is work being done there on fibre measurement or identification?
   No ____ Terminate interview.
   Yes x Continue with 2.

2. What types of fibres are you measuring or identifying?
   2.1 Asbestos? Yes x No ____
   2.1.1 If yes, what kinds of asbestos?
      Chrysotile x
      Amosite x
      Crocidolite
      Anthophylite
      Tremolite
      Actinolite
   2.2 Other fibres? Yes ____ No x

2.2.1 If yes, what kinds of fibres?

____

____

____

____

____

(In this questionnaire we refer specifically to asbestos fibres, as our major area of interest. However, we would also like to hear about any other inorganic fibres you may be working with).

____

____

____

____

3. Are you measuring or identifying asbestos fibres in air?

No ____ Jump to Section 4.

Yes _x_ What percentage of your work is measurement or identification in air as opposed to other media? _100_%.

3.1 What percentage of your work on air measurements is service work as opposed to research? _75_%

3.1.1 What percentage of your service work is on air from the work place as opposed to ambient air? _80-90_%

3.1.1.1 What percentage of your air measurements from the work place is personal as opposed to static? ? %.

3.1.2. What general procedures do you use in your service work on air from the work place? (Include sampling, test procedure and instrumentation).

NIOSH P & CAM 239

3.1.2.1 What modifications have you made in these procedures?

None.

3.1.2.2 Have you developed any new instruments in your laboratory for use on air from the work place?

Yes _____ No _x___

If yes, please describe.

3.1.2.3 Have you imported any new instruments or attachments for use on air from the work place? Yes____ No _x___

If yes, please describe.

3.1.2.4 Are you obtaining information on sampling, test procedure, or instrumentation from outside Canada?

Yes _x_ No ____

If yes, what sort of information and from whom?

Through technical literature only.

3.1.2.5 Are you participating in an information exchange with persons outside Canada? Yes ____ No _x_.

If yes, what sort of information are you exchanging, with whom, and on what basis? (through an organization (name?), personal contact, etc.).

3.1.3 What general procedures are you using on ambient air? (include sampling, test procedure and instrumentation).

NIOSH P & CAM 239, when requested by client

3.1.3.1 What modifications have you made in these procedures?

None

3.1.3.2 Have you developed any new instruments or attachments for ambient air in your laboratory? Yes ____ No x
If yes, please describe.

3.1.3.3 Have you imported any new instruments or attachments for ambient air? Yes ____ No _x_.

If yes, please describe.

3.1.3.4 Are you obtaining information on sampling, test procedure or instrumentation for ambient air from outside Canada? Yes _x_ No ____

If yes, what sort of information and from whom?

Through technical literature only.

3.1.3.5 Are you participating in an information exchange with persons outside Canada on asbestos fibre measurements or identification in ambient air?

Yes ____ No _x_

If yes, what sort of information are you exchanging, with whom and on what basis? (through an organization (name?), personal contact, etc.).

3.1.4 How much service work is actually done there on asbestos fibre in air?

3.1.4.1 Samples/Day: 2

3.1.4.2 Dollar Value: $12,000 - $13,000/Year

3.1.4.3 What is the source of funds for this work?

Fee for service.

3.1.5 How long has your laboratory been doing service work in asbestos fibre measurement or identification in air? _6_ years.

3.1.6 What future plans do you have for the service work in asbestos fibre measurement and identification in air? (include possible changes in method and equipment).

To adopt the Ontario Ministry of Labour procedure.

3.2 Presumably the proportion of your activity in fibre measurement and identification which is not service work, is research. Is this a correct assumption?

No _____. Please explain.

Yes x. Continue through 3.2.1.

3.2.1 What research projects are underway on asbestos fibre measurement or identification in air?

3.2.1.1 On sampling?

3.2.1.2 On test procedures?

Determination of relationship between optical and TEM counting results for various asbestos containing environments.

Comparison of various optical counting procedures.

3.2.1.3 On instrumentation?

3.2.2 How much research work is actually done there on asbestos fibre measurement or identification in air?

3.2.2.1 Man-hours/week: 3

3.2.2.2 Dollar Value: $7,500/Year

3.2.2.3 What is the source of funds for this work?

Internally funded by Ontario Research.

3.2.3 Have you imported any specialty instruments or attachments for your research work on asbestos fibre in air?

Yes __x__ No _____

If yes, please describe.

Walton-Beckett graticule

3.2.4 Are you obtaining information or participating in an information exchange on research into the measurement or identification of asbestos fibres in air with persons outside Canada?

Yes __x__ No _____

If yes, what sort of information are you obtaining or exchanging, with whom and on what basis? (through an organization (name?) personal contact, etc.).

- Obtaining information through the literature.
- No information exchange.

3.2.5 What past research work has your laboratory done on asbestos fibre measurement or identification in air?

3.2.5.1 On sampling?

3.2.5.2 On test procedures?

3.2.5.3 On instrumentation?

This year's program commenced last year.

3.2.6 How long has your laboratory been doing research work on asbestos fibre measurement or identification in air?

6 years.

3.2.7 What future research work is planned on asbestos fibre measurement or identification in air?

3.2.7.1 On sampling?

3.2.7.2 On test procedure?

3.2.7.3 On instrumentation?

We expect to continue same project next year.

4. Are you measuring or identifying asbestos fibres in water?

No _x__ Jump to Section 5.

Yes _____ What percentage of your work is measurement or identification in water as opposed to other media? _____%.

4.1 What percentage of your work on asbestos fibre measurement or identification in water is service work as opposed to research? _____%.

4.1.1 What general procedures do you use for asbestos fibre measurements or identification in water? (include sampling, test procedures and instrumentation).

4.1.1.1 What modifications have you made in these procedures?

4.1.1.2 Have you developed any new instruments or attachments in your laboratory for use in water measurement or identification? Yes ____ No ____

If yes, please describe? ____________

4.1.1.3 Have you imported any new instruments or attachments for use in water measurement or identification?

Yes ____ No ____

If yes, please describe?

4.1.1.4 Are you obtaining information on sampling, test procedure or instrumentation for measurement or identification of asbestos fibre in water from outside Canada?

Yes ____ No ____

If yes, what sort of information and from whom?

4.1.1.4 (Continued) If yes, what sort of information and from whom?

____

____

____

____

____

____

4.1.1.5 Are you participating in an information exchange with persons outside Canada on asbestos fibre measurement or identification in water?

Yes____ No _____

If yes, what sort of information are you exchanging, with whom and on what basis? (through an organization (name), personal contact, etc.).

____

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____

____

4.1.2 How much service work is actually done there on the measurement and identification of asbestos fibres in water?

4.1.2.1 Man-hours/Week: ________

4.1.2.2 Dollar Value:

4.1.2.3 What is the source of funds for this work?

____

____

____

____

____

____

____

4.1.4 What are your future plans for asbestos fibre measurement and identification in water? (include possible changes in method and equipment.

4.2 Presumably, that proportion of your activity in asbestos fibre measurements or identification which is not service work, is research. Is this a correct assumption?

No _____ Please explain.

Yes ____ Continue through 4.2.1.

4.2.1 What research projects are underway on asbestos fibre measurement or identification in water?

4.2.1.1 On Sampling? ____________________

4.2.1.2 On test procedures? ______________________

4.2.1.3 On instrumentation? ______________________

4.2.2 How much research is actually done there on the measurement or identification of asbestos fibres in water?

4.2.2.1 Man-hours/week:
4.2.2.2 Dollar Value:

4.2.2.3 What is the source of funds for this work?

4.2.3 Have you imported any new instruments or attachments for your research work on asbestos fibre in water?

Yes ______ No ______

If yes, please describe.

____
____
____
____
____
____
____
____
____
____

4.2.4 Are you obtaining information or participating in an information exchange on research into the measurement or identification of asbestos fibres in water with persons outside Canada?

Yes ______ No ______

If yes, what sort of information are you obtaining or exchanging, with whom and on what basis? (through an organization (name?) personal contact, etc.).

____
____
____
____
____
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____
____

4.2.5 What past research work has your laboratory done on asbestos fibre measurement or identification in water?

4.2.5.1 On sampling?________________________________

4.2.5.2 On test procedures? ____________________________

4.2.5.3 On instrumentation? ___________________________

4.2.6 How long has your laboratory been doing research work on asbestos fibre measurement or identification in water?__________________

4.2.7 What future research work is planned on asbestos fibre measurement or identification in water?

4.2.7.1 On sampling? ______

4.2.7.2 On test procedure? ______

4.2.7.3 On instrumentation? ______

5. Have you done any asbestos fibre identification in biological samples?

Yes ____ No x

If yes, on what samples and under what circumstances?

______

5.1 What procedures are you using on biological samples?

5.1.1 What modifications have you made in these procedures?

6. Have you done any asbestos fibre measurement or identification in media other than air, water or biological specimens?

Yes x NO

If yes, on what materials and under what circumstances?

Bulk samples.

6.1 What procedures do you use?

- polarized light microscopy - dispersion staining
- X-ray diffraction

6.1.1 What modifications have you made in these procedures?

7. Who else do you know in Canada is working on inorganic fibre measurement or identification?

Those persons who participated in the asbestos fibre measurements at McGill University.

8. What areas of research do you think deserve further work?

Standardization of method world wide.

Improvement of method to reduce the subjectivity of counting.

Interviewer: W.D. Brown Date: 25 November 80

Q-26

ASBESTOS FIBRE MEASUREMENT SURVEY

My name is Doug Brown of the Ontario Research Foundation. We are doing a cross-Canada survey for Energy, Mines and Resources Canada to determine what work is being done on the measurement of inorganic fibres, particularly asbestos, in air and in water. This is needed for Energy, Mines and Resources own information and for the international technical co-operation program operated through the European Economic Community. Thus the information obtained in the survey will become public property.

Are you willing to spend a few minutes answering questions on your work in the area?

Name of Company: Mines Accident Prevention Association of Ontario
Address: 290 Second Avenue West, North Bay, Ontario P1B 3K9
Telephone No.: (705) 472-4140
Name of Interviewee: Peter Chmara
Position: Senior Engineer

1. Is work being done there on fibre measurement or identification?
   No ____ Terminate interview.
   Yes x Continue with 2.

2. What types of fibres are you measuring or identifying?
   2.1 Asbestos? Yes x No ____
   2.1.1 If yes, what kinds of asbestos?
   Chrysotile x
   Amosite
   Crocidolite
   Anthophylite
   Tremolite
   Actinolite
   2.2 Other fibres? Yes x No ____

2.2.1 If yes, what kinds of fibres?

Talc

(In this questionnaire we refer specifically to asbestos fibres, as our major area of interest. However, we would also like to hear about any other inorganic fibres you may be working with).

3. Are you measuring or identifying asbestos fibres in air?

No ____ Jump to Section 4.

Yes _x_ What percentage of your work is measurement or identification in air as opposed to other media? _100_ %.

3.1 What percentage of your work on air measurements is service work as opposed to research? _100_ %

3.1.1 What percentage of your service work is on air from the work place as opposed to ambient air? _90_ %

3.1.1.1 What percentage of your air measurements from the work place is personal as opposed to static? 2 %.

3.1.2. What general procedures do you use in your service work on air from the work place? (Include sampling, test procedure and instrumentation).

NIOSH 2

3.1.2.1 What modifications have you made in these procedures?

None

3.1.2.2 Have you developed any new instruments in your laboratory for use on air from the work place?

Yes _____ No __x__

If yes, please describe.

3.1.2.3 Have you imported any new instruments or attachments for use on air from the work place? Yes____ No __x__

If yes, please describe.

3.1.2.4 Are you obtaining information on sampling, test procedure, or instrumentation from outside Canada?

Yes x No ____

If yes, what sort of information and from whom?

Only through literature and through McGill University.

3.1.2.5 Are you participating in an information exchange with persons outside Canada? Yes ____ No x.

If yes, what sort of information are you exchanging, with whom, and on what basis? (through an organization (name?), personal contact, etc.).

3.1.3 What general procedures are you using on ambient air? (include sampling, test procedure and instrumentation).

Same procedure: NIOSH 2

3.1.3.1 What modifications have you made in these procedures?

None

3.1.3.2 Have you developed any new instruments or attachments for ambient air in your laboratory? Yes ____ No x
If yes, please describe.

3.1.3.3 Have you imported any new instruments or attachments for ambient air? Yes ____ No _x_.

If yes, please describe.

3.1.3.4 Are you obtaining information on sampling, test procedure or instrumentation for ambient air from outside Canada? Yes _x_ No ____

If yes, what sort of information and from whom?

Through the literature and McGill University.

3.1.3.5 Are you participating in an information exchange with persons outside Canada on asbestos fibre measurements or identification in ambient air?

Yes ____ No _x_

If yes, what sort of information are you exchanging, with whom and on what basis? (through an organization (name?), personal contact, etc.).

3.1.4. How much service work is actually done there on asbestos fibre in air?

3.1.4.1 Samples/~~Day~~ Month: 150

3.1.4.2 Dollar-Value: ________

3.1.4.3 What is the source of funds for this work?

WCB

3.1.5 How long has your laboratory been doing service work in asbestos fibre measurement or identification in air? _5_ years.

3.1.6 What future plans do you have for the service work in asbestos fibre measurement and identification in air? (include possible changes in method and equipment).

Plan to change over to AIA method, probably in December 1980.

3.2 Presumably the proportion of your activity in fibre measurement and identification which is not service work, is research. Is this a correct assumption?

No _____. Please explain.

No research

Yes ____. Continue through 3.2.1.

3.2.1 What research projects are underway on asbestos fibre measurement or identification in air?

3.2.1.1 On sampling?

3.2.1.2 On test procedures?

3.2.1.3 On instrumentation?

3.2.2 How much research work is actually done there on asbestos fibre measurement or identification in air?

3.2.2.1 Man-hours/week: ________

3.2.2.2 Dollar Value: ________

3.2.2.3 What is the source of funds for this work?

3.2.3 Have you imported any specialty instruments or attachments for your research work on asbestos fibre in air?

Yes _____ No _____

If yes, please describe.

3.2.4 Are you obtaining information or participating in an information exchange on research into the measurement or identification of asbestos fibres in air with persons outside Canada?

Yes _____ No _____

If yes, what sort of information are you obtaining or exchanging, with whom and on what basis? (through an organization (name?) personal contact, etc.).

3.2.5 What past research work has your laboratory done on asbestos fibre measurement or identification in air?

3.2.5.1 On sampling?

3.2.5.2 On test procedures?

3.2.5.3 On instrumentation?

3.2.6 How long has your laboratory been doing research work on asbestos fibre measurement or identification in air?

3.2.7 What future research work is planned on asbestos fibre measurement or identification in air?

3.2.7.1 On sampling?

3.2.7.2 On test procedure?

3.2.7.3 On instrumentation?

4. Are you measuring or identifying asbestos fibres in water?

No _x___ Jump to Section 5.

Yes _____ What percentage of your work is measurement or identification in water as opposed to other media? _____%.

4.1 What percentage of your work on asbestos fibre measurement or identification in water is service work as opposed to research? _____%.

4.1.1 What general procedures do you use for asbestos fibre measurements or identification in water? (include sampling, test procedures and instrumentation).

4.1.1.1 What modifications have you made in these procedures?

4.1.1.2 Have you developed any new instruments or attachments in your laboratory for use in water measurement or identification? Yes ____ No _____

If yes, please describe? ______________________________

4.1.1.3 Have you imported any new instruments or attachments for use in water measurement or identification?

Yes ____ No ____

If yes, please describe?

4.1.1.4 Are you obtaining information on sampling, test procedure or instrumentation for measurement or identification of asbestos fibre in water from outside Canada?

Yes ____ No _____

If yes, what sort of information and from whom?

4.1.1.4 (Continued) If yes, what sort of information and from whom?

4.1.1.5 Are you participating in an information exchange with persons outside Canada on asbestos fibre measurement or identification in water?

Yes____ No _____

If yes, what sort of information are you exchanging, with whom and on what basis? (through an organization (name), personal contact, etc.).

4.1.2 How much service work is actually done there on the measurement and identification of asbestos fibres in water?

4.1.2.1 Man-hours/Week: _______

4.1.2.2 Dollar Value:

4.1.2.3 What is the source of funds for this work?

4.1.4 What are your future plans for asbestos fibre measurement and identification in water? (include possible changes in method and equipment.

____

____

____

____

4.2 Presumably, that proportion of your activity in asbestos fibre measurements or identification which is not service work, is research. Is this a correct assumption?

No _____ Please explain.

____

____

____

____

____

Yes ____ Continue through 4.2.1.

4.2.1 What research projects are underway on asbestos fibre measurement or identification in water?

4.2.1.1 On Sampling? ____

____

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____

____

4.2.1.2 On test procedures?

4.2.1.3 On instrumentation?

4.2.2 How much research is actually done there on the measurement or identification of asbestos fibres in water?

4.2.2.1 Man-hours/week:
4.2.2.2 Dollar Value:

4.2.2.3 What is the source of funds for this work?

4.2.3 Have you imported any new instruments or attachments for your research work on asbestos fibre in water?

Yes ______ No ______

If yes, please describe.

4.2.4 Are you obtaining information or participating in an information exchange on research into the measurement or identification of asbestos fibres in water with persons outside Canada?

Yes ______ No ______

If yes, what sort of information are you obtaining or exchanging, with whom and on what basis? (through an organization (name?) personal contact, etc.).

4.2.5 What past research work has your laboratory done on asbestos fibre measurement or identification in water?

4.2.5.1 On sampling?____________________________

4.2.5.2 On test procedures? ________________________

4.2.5.3 On instrumentation? ________________________

4.2.6 How long has your laboratory been doing research work on asbestos fibre measurement or identification in water?________________

4.2.7 What future research work is planned on asbestos fibre measurement or identification in water?

4.2.7.1 On sampling? ____________________

4.2.7.2 On test procedure? ____________________

4.2.7.3 On instrumentation? ____________________

5. Have you done any asbestos fibre identification in biological samples?

Yes _____ No __x__

If yes, on what samples and under what circumstances?

5.1 What procedures are you using on biological samples?

5.1.1 What modifications have you made in these procedures?

6. Have you done any asbestos fibre measurement or identification in media other than air, water or biological specimens?

Yes _____ NO __x__

If yes, on what materials and under what circumstances?

6.1 What procedures do you use?

6.1.1 What modifications have you made in these procedures?

7. Who else do you know in Canada is working on inorganic fibre measurement or identification?

Only those persons who attended the McGill counting trials.

8. What areas of research do you think deserve further work?

1. Development of a simple and inexpensive method of identifying fibres.

2. More data is needed on physiological effects of various fibres.

Interviewer: W.D. Brown

Date: November 7, 1980

Q-27

ASBESTOS FIBRE MEASUREMENT SURVEY

My name is Doug Brown of the Ontario Research Foundation. We are doing a cross-Canada survey for Energy, Mines and Resources Canada to determine what work is being done on the measurement of inorganic fibres, particularly asbestos, in air and in water. This is needed for Energy, Mines and Resources own information and for the international technical co-operation program operated through the European Economic Community. Thus the information obtained in the survey will become public property.

Are you willing to spend a few minutes answering questions on your work in the area?

Name of Company Chemsearch
Address 727 King Street West, Toronto, Ontario M5E 1M9
Telephone No. 368-5337
Name of Interviewee Dr. P. Seth
Position Laboratory Controller

1. Is work being done there on fibre measurement or identification?
   No ____ Terminate interview.
   Yes x Continue with 2.

2. What types of fibres are you measuring or identifying?
   2.1 Asbestos? Yes x No ____
   2.1.1 If yes, what kinds of asbestos?
      Chrysotile x
      Amosite x
      Crocidolite x
      Anthophylite x
      Tremolite x
      Actinolite x
   2.2 Other fibres? Yes x No ____

2.2.1 If yes, what kinds of fibres?

Silica, glass.

(In this questionnaire we refer specifically to asbestos fibres, as our major area of interest. However, we would also like to hear about any other inorganic fibres you may be working with).

3. Are you measuring or identifying asbestos fibres in air?

No ____ Jump to Section 4.

Yes x What percentage of your work is measurement or identification in air as opposed to other media? 75 %.

3.1 What percentage of your work on air measurements is service work as opposed to research? 100 %

3.1.1 What percentage of your service work is on air from the work place as opposed to ambient air? 60 %

Mostly on buildings containing asbestos and in factories.

3.1.1.1 What percentage of your air measurements from the work place is personal as opposed to static? 35 %.

3.1.2. What general procedures do you use in your service work on air from the work place? (Include sampling, test procedure and instrumentation).

NIOSH P & CAM 239

3.1.2.1 What modifications have you made in these procedures?

None.

3.1.2.2 Have you developed any new instruments in your laboratory for use on air from the work place?

Yes _____ No _____

If yes, please describe.

We are developing a new pump for personal sampling.

We developed an air sampling unit for static sampling.

3.1.2.3 Have you imported any new instruments or attachments for use on air from the work place? Yes____ No x

If yes, please describe.

3.1.2.4 Are you obtaining information on sampling, test procedure, or instrumentation from outside Canada?

Yes __x__ No _____

If yes, what sort of information and from whom?

We are in contact with other environmental laboratories in the United States, with whom we consult on problems to do with analysis and sampling.

3.1.2.5 Are you participating in an information exchange with persons outside Canada? Yes _x__ No _____.

If yes, what sort of information are you exchanging, with whom, and on what basis? (through an organization (name?), personal contact, etc.).

With other environmental laboratories in U.S. as in 3.1.2.4.

3.1.3 What general procedures are you using on ambient air? (include sampling, test procedure and instrumentation).

NIOSH P & CAM 239

3.1.3.1 What modifications have you made in these procedures?

None

3.1.3.2 Have you developed any new instruments or attachments for ambient air in your laboratory? Yes x No ____
If yes, please describe.

- An air sampling unit for static sampling as mentioned in 3.1.2.2.

3.1.3.3 Have you imported any new instruments or attachments for ambient air? Yes ____ No _x_.

If yes, please describe.

3.1.3.4 Are you obtaining information on sampling, test procedure or instrumentation for ambient air from outside Canada?
Yes _x_ No ____

If yes, what sort of information and from whom?

Same as in 3.1.2.4.

3.1.3.5 Are you participating in an information exchange with persons outside Canada on asbestos fibre measurements or identification in ambient air?

Yes x No ____

If yes, what sort of information are you exchanging, with whom and on what basis? (through an organization (name?), personal contact, etc.).

Same as in 3.1.2.5.

3.1.4 How much service work is actually done there on asbestos fibre in air?

3.1.4.1 Samples 20/month

3.1.4.2 Dollar Value: $4000/month

3.1.4.3 What is the source of funds for this work?

Industrial clients, school boards.

3.1.5 How long has your laboratory been doing service work in asbestos fibre measurement or identification in air? 1½ years.

3.1.6 What future plans do you have for the service work in asbestos fibre measurement and identification in air? (include possible changes in method and equipment).

Expect to become more involved with industrial measurements in Ontario.

3.2 Presumably the proportion of your activity in fibre measurement and identification which is not service work, is research. Is this a correct assumption?

No _____. Please explain.

Yes _x_. Continue through 3.2.1.

3.2.1 What research projects are underway on asbestos fibre measurement or identification in air?

3.2.1.1 On sampling?

Development of sample pump.

3.2.1.2 On test procedures?

None.

3.2.1.3 On instrumentation?

None.

3.2.2 How much research work is actually done there on asbestos fibre measurement or identification in air?

3.2.2.1 Man-hours/week: 7-8 man-months/year

3.2.2.2 Dollar Value: $50,000

3.2.2.3 What is the source of funds for this work?

Cannot say.

3.2.3 Have you imported any specialty instruments or attachments for your research work on asbestos fibre in air?

Yes _____ No x____

If yes, please describe.

3.2.4 Are you obtaining information or participating in an information exchange on research into the measurement or identification of asbestos fibres in air with persons outside Canada?

Yes _x__ No _____

If yes, what sort of information are you obtaining or exchanging, with whom and on what basis? (through an organization (name?) personal contact, etc.).

From other environmental laboratories and from literature.

3.2.5 What past research work has your laboratory done on asbestos fibre measurement or identification in air?

3.2.5.1 On sampling?

None.

3.2.5.2 On test procedures?

None.

3.2.5.3 On instrumentation?

None.

3.2.6 How long has your laboratory been doing research work on asbestos fibre measurement or identification in air?

1½ years.

3.2.7 What future research work is planned on asbestos fibre measurement or identification in air?

We are applying for grants to hire more people for R. & D. work. No specific programs are in mind at the moment.

3.2.7.1 On sampling?

3.2.7.2 On test procedure?

3.2.7.3 On instrumentation?

4. Are you measuring or identifying asbestos fibres in water?

No x____ Jump to Section 5.

Yes _____ What percentage of your work is measurement or identification in water as opposed to other media? _____%.

4.1 What percentage of your work on asbestos fibre measurement or identification in water is service work as opposed to research? _____%.

4.1.1 What general procedures do you use for asbestos fibre measurements or identification in water? (include sampling, test procedures and instrumentation).

4.1.1.1 What modifications have you made in these procedures?

4.1.1.2 Have you developed any new instruments or attachments in your laboratory for use in water measurement or identification? Yes ____ No ____

If yes, please describe? ____________________

4.1.1.3 Have you imported any new instruments or attachments for use in water measurement or identification?

Yes ____ No ____

If yes, please describe?

4.1.1.4 Are you obtaining information on sampling, test procedure or instrumentation for measurement or identification of asbestos fibre in water from outside Canada?

Yes ____ No ____

If yes, what sort of information and from whom?

4.1.1.4 (Continued) If yes, what sort of information and from whom?

4.1.1.5 Are you participating in an information exchange with persons outside Canada on asbestos fibre measurement or identification in water?

Yes____ No _____

If yes, what sort of information are you exchanging, with whom and on what basis? (through an organization (name), personal contact, etc.).

4.1.2 How much service work is actually done there on the measurement and identification of asbestos fibres in water?

4.1.2.1 Man-hours/Week: _______

4.1.2.2 Dollar Value:

4.1.2.3 What is the source of funds for this work?

4.1.4 What are your future plans for asbestos fibre measurement and identification in water? (include possible changes in method and equipment.

4.2 Presumably, that proportion of your activity in asbestos fibre measurements or identification which is not service work, is research. Is this a correct assumption?

No _____ Please explain.

Yes ____ Continue through 4.2.1.

4.2.1 What research projects are underway on asbestos fibre measurement or identification in water?

4.2.1.1 On Sampling? ____________________

4.2.1.2 On test procedures?

4.2.1.3 On instrumentation?

4.2.2 How much research is actually done there on the measurement or identification of asbestos fibres in water?

4.2.2.1 Man-hours/week:
4.2.2.2 Dollar Value:

4.2.2.3 What is the source of funds for this work?

4.2.3 Have you imported any new instruments or attachments for your research work on asbestos fibre in water?

Yes ______ No _______

If yes, please describe.

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4.2.4 Are you obtaining information or participating in an information exchange on research into the measurement or identification of asbestos fibres in water with persons outside Canada?

Yes _______ No _______

If yes, what sort of information are you obtaining or exchanging, with whom and on what basis? (through an organization (name?) personal contact, etc.).

____

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4.2.5 What past research work has your laboratory done on asbestos fibre measurement or identification in water?

4.2.5.1 On sampling? ____________________

4.2.5.2 On test procedures? ____________________

4.2.5.3 On instrumentation? ____________________

4.2.6 How long has your laboratory been doing research work on asbestos fibre measurement or identification in water? ____________________

4.2.7 What future research work is planned on asbestos fibre measurement or identification in water?

4.2.7.1 On sampling? ____________________

4.2.7.2 On test procedure? ____________________

4.2.7.3 On instrumentation? ____________________

5. Have you done any asbestos fibre identification in biological samples?

Yes _____ No __x__

If yes, on what samples and under what circumstances?

5.1 What procedures are you using on biological samples?

5.1.1 What modifications have you made in these procedures?

6. Have you done any asbestos fibre measurement or identification in media other than air, water or biological specimens?

Yes x NO

If yes, on what materials and under what circumstances?

Insulations, asbestos-cement, asbestos sheetings.

6.1 What procedures do you use?

Polarized light microscopy, X-ray diffraction, IR spectroscopy

6.1.1 What modifications have you made in these procedures?

7. Who else do you know in Canada is working on inorganic fibre measurement or identification?

None.

8. What areas of research do you think deserve further work?

- Automatic counting systems.
- Automatic field monitors.
- Quantitative methodology development.

Interviewer: W.D. Brown

Date: December 12, 1980

Q-2E

ASBESTOS FIBRE MEASUREMENT SURVEY

My name is Doug Brown of the Ontario Research Foundation. We are doing a cross-Canada survey for Energy, Mines and Resources Canada to determine what work is being done on the measurement of inorganic fibres, particularly asbestos, in air and in water. This is needed for Energy, Mines and Resources own information and for the international technical co-operation program operated through the European Economic Community. Thus the information obtained in the survey will become public property.

Are you willing to spend a few minutes answering questions on your work in the area?

Name of Company Concord Scientific Corporation
Address 630 Rivermede Road, Concord, Ontario L4K 1B6
Telephone No. (416) 669-4855
Name of Interviewee David Fulton
Position Manager, Occupational Hygiene & Environmental Monitoring

1. Is work being done there on fibre measurement or identification?
   No ____ Terminate interview.
   Yes x Continue with 2.

2. What types of fibres are you measuring or identifying?
   2.1 Asbestos? Yes x No ____
   2.1.1 If yes, what kinds of asbestos?
      Chrysotile x
      Amosite x
      Crocidolite x
      Anthophylite
      Tremolite
      Actinolite
   2.2 Other fibres? Yes x No ____

2.2.1 If yes, what kinds of fibres?

Glass.

(In this questionnaire we refer specifically to asbestos fibres, as our major area of interest. However, we would also like to hear about any other inorganic fibres you may be working with).

3. Are you measuring or identifying asbestos fibres in air?

No ____ Jump to Section 4.

Yes x What percentage of your work is measurement or identification in air as opposed to other media? ____%.

- Would rather not say.

3.1 What percentage of your work on air measurements is service work as opposed to research? 100 %

3.1.1 What percentage of your service work is on air from the work place as opposed to ambient air? 50 %

3.1.1.1 What percentage of your air measurements from the work place is personal as opposed to static? 10-15%.

3.1.2. What general procedures do you use in your service work on air from the work place? (Include sampling, test procedure and instrumentation).

NIOSH

3.1.2.1 What modifications have you made in these procedures?

In Volumetric flow rate and duration of sampling, variations are made to get 1 - 4 fibres per field area and total of 100 fibres.

- all else is according to NIOSH.

3.1.2.2 Have you developed any new instruments in your laboratory for use on air from the work place?

Yes _____ No __x__

If yes, please describe.

3.1.2.3 Have you imported any specialty instruments or attachments for use on air from the work place? Yes____ No x___

If yes, please describe.

3.1.2.4 Are you obtaining information on sampling, test procedure, or instrumentation from outside Canada?

Yes x No ____

If yes, what sort of information and from whom?

S. Africa, U.K., U.S., through personal contacts with former classmates, etc.

3.1.2.5 Are you participating in an information exchange with persons outside Canada? Yes x No ____.

If yes, what sort of information are you exchanging, with whom, and on what basis? (through an organization (name?), personal contact, etc.).

No formal information exchange - only personal contacts as described under 3.1.2.4.

3.1.3 What general procedures are you using on ambient air? (include sampling, test procedure and instrumentation).

NIOSH

3.1.3.1 What modifications have you made in these procedures?

As under 3.1.2.1.

3.1.3.2 Have you developed any new instruments or attachments for ambient air in your laboratory? Yes ____ No _x_
If yes, please describe.

3.1.3.3 Have you imported any new instruments or attachments for ambient air? Yes x No ____.

If yes, please describe.

Dispersion staining liquid standards (high refractive index) from McCrone Associates, Chicago.

3.1.3.4 Are you obtaining information on sampling, test procedure or instrumentation for ambient air from outside Canada? Yes x No ____

If yes, what sort of information and from whom?

S. Africa, U.K., U.S., through personal contacts as described under 3.1.2.4.

3.1.3.5 Are you participating in an information exchange with persons outside Canada on asbestos fibre measurements or identification in ambient air?

Yes x No ____

If yes, what sort of information are you exchanging, with whom and on what basis? (through an organization (name?), personal contact, etc.).

As under 3.1.3.4.

3.1.4 How much service work is actually done there on asbestos fibre in air?

3.1.4.1 Samples/Day: --

3.1.4.2 Dollar Value: --

3.1.4.3 What is the source of funds for this work?

From private citizens to industry and government agencies at all levels. A very broad spectrum of funding.

3.1.5 How long has your laboratory been doing service work in asbestos fibre measurement or identification in air? 1 year.

3.1.6 What future plans do you have for the service work in asbestos fibre measurement and identification in air? (include possible changes in method and equipment).

- Continuation of present work
- Would like to look at alternative techniques, e.g. IR

3.2 Presumably the proportion of your activity in fibre measurement and identification which is not service work, is research. Is this a correct assumption?

No x. Please explain.

Service work is 100%.

Yes ____. Continue through 3.2.1.

3.2.1 What research projects are underway on asbestos fibre measurement or identification in air?

3.2.1.1 On sampling?

None.

3.2.1.2 On test procedures?

None.

3.2.1.3 On instrumentation?

None.

3.2.2 How much research work is actually done there on asbestos fibre measurement or identification in air?

3.2.2.1 Man-hours/week: ______

3.2.2.2 Dollar Value: ______

3.2.2.3 What is the source of funds for this work?

3.2.3 Have you imported any specialty instruments or attachments for your research work on asbestos fibre in air?

Yes _____ No _____

If yes, please describe.

3.2.4 Are you obtaining information or participating in an information exchange on research into the measurement or identification of asbestos fibres in air with persons outside Canada?

Yes _____ No _____

If yes, what sort of information are you obtaining or exchanging, with whom and on what basis? (through an organization (name?) personal contact, etc.).

3.2.5 What past research work has your laboratory done on asbestos fibre measurement or identification in air?

3.2.5.1 On sampling?

3.2.5.2 On test procedures?

3.2.5.3 On instrumentation?

3.2.6 How long has your laboratory been doing research work on asbestos fibre measurement or identification in air?

3.2.7 What future research work is planned on asbestos fibre measurement or identification in air?

3.2.7.1 On sampling?

3.2.7.2 On test procedure?

3.2.7.3 On instrumentation?

4. Are you measuring or identifying asbestos fibres in water?

No ___x___ Jump to Section 5.

Yes _____ What percentage of your work is measurement or identification in water as opposed to other media? _____%.

4.1 What percentage of your work on asbestos fibre measurement or identification in water is service work as opposed to research? _____%.

4.1.1 What general procedures do you use for asbestos fibre measurements or identification in water? (include sampling, test procedures and instrumentation).

4.1.1.1 What modifications have you made in these procedures?

4.1.1.2 Have you developed any new instruments or attachments in your laboratory for use in water measurement or identification? Yes ____ No ____

If yes, please describe? ______________________

4.1.1.3 Have you imported any new instruments or attachments for use in water measurement or identification?

Yes ____ No ____

If yes, please describe?

4.1.1.4 Are you obtaining information on sampling, test procedure or instrumentation for measurement or identification of asbestos fibre in water from outside Canada?

Yes ____ No ____

If yes, what sort of information and from whom?

4.1.1.4 (Continued) If yes, what sort of information and from whom?

4.1.1.5 Are you participating in an information exchange with persons outside Canada on asbestos fibre measurement or identification in water?

Yes____ No _____

If yes, what sort of information are you exchanging, with whom and on what basis? (through an organization (name), personal contact, etc.).

4.1.2 How much service work is actually done there on the measurement and identification of asbestos fibres in water?

4.1.2.1 Man-hours/Week: _______

4.1.2.2 Dollar Value:

4.1.2.3 What is the source of funds for this work?

4.1.4 What are your future plans for asbestos fibre measurement and identification in water? (include possible changes in method and equipment.

4.2 Presumably, that proportion of your activity in asbestos fibre measurements or identification which is not service work, is research. Is this a correct assumption?

No _____ Please explain.

Yes ____ Continue through 4.2.1.

4.2.1 What research projects are underway on asbestos fibre measurement or identification in water?

4.2.1.1 On Sampling? ______________________________

4.2.1.2 On test procedures?

4.2.1.3 On instrumentation?

4.2.2 How much research is actually done there on the measurement or identification of asbestos fibres in water?

4.2.2.1 Man-hours/week:
4.2.2.2 Dollar Value:

4.2.2.3 What is the source of funds for this work?

4.2.3 Have you imported any new instruments or attachments for your research work on asbestos fibre in water?

Yes ______ No ______

If yes, please describe.

4.2.4 Are you obtaining information or participating in an information exchange on research into the measurement or identification of asbestos fibres in water with persons outside Canada?

Yes ______ No ______

If yes, what sort of information are you obtaining or exchanging, with whom and on what basis? (through an organization (name?) personal contact, etc.).

4.2.5 What past research work has your laboratory done on asbestos fibre measurement or identification in water?

4.2.5.1 On sampling?

4.2.5.2 On test procedures?

4.2.5.3 On instrumentation?

4.2.6 How long has your laboratory been doing research work on asbestos fibre measurement or identification in water?

4.2.7 What future research work is planned on asbestos fibre measurement or identification in water?

4.2.7.1 On sampling? ______

4.2.7.2 On test procedure? ______

4.2.7.3 On instrumentation? ______

5. Have you done any asbestos fibre identification in biological samples?

Yes ___ No _x_

If yes, on what samples and under what circumstances?

5.1 What procedures are you using on biological samples?

5.1.1 What modifications have you made in these procedures?

6. Have you done any asbestos fibre measurement or identification in media other than air, water or biological specimens?

Yes x NO ____

If yes, on what materials and under what circumstances?

Bulk: insulation products, transite, plastics, brake linings, etc.

6.1 What procedures do you use?

- Optical and chemical identification
- Refractive indices
- Angles of distinction
- Dispersion staining

6.1.1 What modifications have you made in these procedures?

Dispersion staining: We have made our own colour standards.

One problem is obtaining asbestos fibre standards for bulk sample identification work. We have obtained some from S. Africa and England.

7. Who else do you know in Canada is working on inorganic fibre measurement or identification?

- Ontario Hydro
- Ministry of Labour
- McMaster
- McGill
- Western Ontario, Dr. Sullivan
- X-Ral Laboratories on Don Mills Road
- University of Toronto - Medical Faculty, Dr. Jim Stopps
- University of Toronto - Geology Dept. (?)

8. What areas of research do you think deserve further work?

(1) Automated counting system with classifcation by length and aspect ratio.

(2) Continuous comparison of results between laboratories with development of standards.

(3) Validation of dispersion staining techniques for bulk samples.

Interviewer: W.D. Brown Date: 29 October 1980

Q-29

ASBESTOS FIBRE MEASUREMENT SURVEY

My name is Doug Brown of the Ontario Research Foundation. We are doing a cross-Canada survey for Energy, Mines and Resources Canada to determine what work is being done on the measurement of inorganic fibres, particularly asbestos, in air and in water. This is needed for Energy, Mines and Resources own information and for the international technical co-operation program operated through the European Economic Community. Thus the information obtained in the survey will become public property.

Are you willing to spend a few minutes answering questions on your work in the area?

Name of Company Inco Limited
Address 1 First Canadian Place
Telephone No. 361-7869
Name of Interviewee Dr. Ernest Mastromatteo
Position Dir. Occupational Health

1. Is work being done there on fibre measurement or identification?
   No ____ Terminate interview.
   Yes x Continue with 2.

2. What types of fibres are you measuring or identifying?
   2.1 Asbestos? Yes x No ____
   2.1.1 If yes, what kinds of asbestos?
      Chrysotile x
      Amosite
      Crocidolite
      Anthophylite
      Tremolite
      Actinolite
   2.2 Other fibres? Yes ____ No x

2.2.1 If yes, what kinds of fibres?

(In this questionnaire we refer specifically to asbestos fibres, as our major area of interest. However, we would also like to hear about any other inorganic fibres you may be working with).

3. Are you measuring or identifying asbestos fibres in air?

No ____ Jump to Section 4.

Yes _x_ What percentage of your work is measurement or identification in air as opposed to other media? _99_%.

3.1 What percentage of your work on air measurements is service work as opposed to research? _100_%

3.1.1 What percentage of your service work is on air from the work place as opposed to ambient air? _100_%

3.1.1.1 What percentage of your air measurements from the work place is personal as opposed to static? 80 %.

3.1.2. What general procedures do you use in your service work on air from the work place? (Include sampling, test procedure and instrumentation).

NIOSH P & CAM 239

3.1.2.1 What modifications have you made in these procedures?

None.

3.1.2.2 Have you developed any new instruments in your laboratory for use on air from the work place?

Yes _____ No __x__

If yes, please describe.

3.1.2.3 Have you imported any new instruments or attachments for use on air from the work place? Yes____ No __x__

If yes, please describe.

3.1.2.4 Are you obtaining information on sampling, test procedure, or instrumentation from outside Canada?

Yes _____ No _____

If yes, what sort of information and from whom?

Comparison of results and method with operating affiliates in other countries.

3.1.2.5 Are you participating in an information exchange with persons outside Canada? Yes x No _____.

If yes, what sort of information are you exchanging, with whom, and on what basis? (through an organization (name?), personal contact, etc.).

Same as 3.1.2.4.

3.1.3 What general procedures are you using on ambient air? (include sampling, test procedure and instrumentation).

No ambient air sampling.

3.1.3.1 What modifications have you made in these procedures?

3.1.3.2 Have you developed any new instruments or attachments for ambient air in your laboratory? Yes ____ No ____ If yes, please describe.

3.1.3.3 Have you imported any new instruments or attachments for ambient air? Yes ____ No ____.

If yes, please describe.

3.1.3.4 Are you obtaining information on sampling, test procedure or instrumentation for ambient air from outside Canada? Yes ____ No ____

If yes, what sort of information and from whom?

3.1.3.5 Are you participating in an information exchange with persons outside Canada on asbestos fibre measurements or identification in ambient air?

Yes ____ No ____

If yes, what sort of information are you exchanging, with whom and on what basis? (through an organization (name?), personal contact, etc.).

3.1.4 How much service work is actually done there on asbestos fibre in air?

3.1.4.1 Samples/Day: See Below

3.1.4.2 Dollar Value: ____

3.1.4.3 What is the source of funds for this work?

Measurements are done at various Inco operations across Canada and elsewhere.

3.1.5 How long has your laboratory been doing service work in asbestos fibre measurement or identification in air? ____ years.

3.1.6 What future plans do you have for the service work in asbestos fibre measurement and identification in air? (include possible changes in method and equipment).

To continue monitoring.

3.2 Presumably the proportion of your activity in fibre measurement and identification which is not service work, is research. Is this a correct assumption?

No _____. Please explain.

No research.

Yes ____. Continue through 3.2.1.

3.2.1 What research projects are underway on asbestos fibre measurement or identification in air?

3.2.1.1 On sampling?

3.2.1.2 On test procedures?

3.2.1.3 On instrumentation?

3.2.2 How much research work is actually done there on asbestos fibre measurement or identification in air?

3.2.2.1 Man-hours/week: ________

3.2.2.2 Dollar Value: ________

3.2.2.3 What is the source of funds for this work?

3.2.3 Have you imported any specialty instruments or attachments for your research work on asbestos fibre in air?

Yes _____ No _____

If yes, please describe.

3.2.4 Are you obtaining information or participating in an information exchange on research into the measurement or identification of asbestos fibres in air with persons outside Canada?

Yes _____ No _____

If yes, what sort of information are you obtaining or exchanging, with whom and on what basis? (through an organization (name?) personal contact, etc.).

3.2.5 What past research work has your laboratory done on asbestos fibre measurement or identification in air?

3.2.5.1 On sampling?

3.2.5.2 On test procedures?

3.2.5.3 On instrumentation?

3.2.6 How long has your laboratory been doing research work on asbestos fibre measurement or identification in air?

3.2.7 What future research work is planned on asbestos fibre measurement or identification in air?

Only in conjunction with host rock analysis during mining and processing. See proposed program under Section 6.

3.2.7.1 On sampling?

3.2.7.2 On test procedure?

3.2.7.3 On instrumentation?

4. Are you measuring or identifying asbestos fibres in water?

No No Jump to Section 5.

Yes _____ What percentage of your work is measurement or identification in water as opposed to other media? _____%.

4.1 What percentage of your work on asbestos fibre measurement or identification in water is service work as opposed to research? _____%.

4.1.1 What general procedures do you use for asbestos fibre measurements or identification in water? (include sampling, test procedures and instrumentation).

4.1.1.1 What modifications have you made in these procedures?

4.1.1.2 Have you developed any new instruments or attachments in your laboratory for use in water measurement or identification? Yes ____ No _____

If yes, please describe? ________________________________

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4.1.1.3 Have you imported any new instruments or attachments for use in water measurement or identification?

Yes ____ No ____

If yes, please describe?

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4.1.1.4 Are you obtaining information on sampling, test procedure or instrumentation for measurement or identification of asbestos fibre in water from outside Canada?

Yes ____ No _____

If yes, what sort of information and from whom?

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4.1.1.4 (Continued) If yes, what sort of information and from whom?

4.1.1.5 Are you participating in an information exchange with persons outside Canada on asbestos fibre measurement or identification in water?

Yes____ No _____

If yes, what sort of information are you exchanging, with whom and on what basis? (through an organization (name), personal contact, etc.).

4.1.2 How much service work is actually done there on the measurement and identification of asbestos fibres in water?

4.1.2.1 Man-hours/Week: _______

4.1.2.2 Dollar Value:

4.1.2.3 What is the source of funds for this work?

4.1.4 What are your future plans for asbestos fibre measurement and identification in water? (include possible changes in method and equipment.

4.2 Presumably, that proportion of your activity in asbestos fibre measurements or identification which is not service work, is research. Is this a correct assumption?

No _____ Please explain.

Yes ____ Continue through 4.2.1.

4.2.1 What research projects are underway on asbestos fibre measurement or identification in water?

4.2.1.1 On Sampling? ______________________________

4.2.1.2 On test procedures?

4.2.1.3 On instrumentation?

4.2.2 How much research is actually done there on the measurement or identification of asbestos fibres in water?

4.2.2.1 Man-hours/week:
4.2.2.2 Dollar Value:

4.2.2.3 What is the source of funds for this work?

4.2.3 Have you imported any new instruments or attachments for your research work on asbestos fibre in water?

Yes ______ No ______

If yes, please describe.

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4.2.4 Are you obtaining information or participating in an information exchange on research into the measurement or identification of asbestos fibres in water with persons outside Canada?

Yes ______ No ______

If yes, what sort of information are you obtaining or exchanging, with whom and on what basis? (through an organization (name?) personal contact, etc.).

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4.2.5 What past research work has your laboratory done on asbestos fibre measurement or identification in water?

4.2.5.1 On sampling? ______________________

4.2.5.2 On test procedures? ______________________

4.2.5.3 On instrumentation? ______________________

4.2.6 How long has your laboratory been doing research work on asbestos fibre measurement or identification in water? ______________________

4.2.7 What future research work is planned on asbestos fibre measurement or identification in water?

4.2.7.1 On sampling? ______

4.2.7.2 On test procedure? ______

4.2.7.3 On instrumentation? ______

5. Have you done any asbestos fibre identification in biological samples?

Yes ____ No _x_

If yes, on what samples and under what circumstances?

______

5.1 What procedures are you using on biological samples?

5.1.1 What modifications have you made in these procedures?

6. Have you done any asbestos fibre measurement or identification in media other than air, water or biological specimens?

Yes x NO

If yes, on what materials and under what circumstances?

The identification of fibres in host rock is carried out at Sheridan Park research station using SEM. A future research program is planned on composite rock samples using SEM and TEM, and also on rock during and after processing. Air monitoring will be done in conjunction with this work.

6.1 What procedures do you use?

SEM and (in future) TEM.

6.1.1 What modifications have you made in these procedures?

7. Who else do you know in Canada is working on inorganic fibre measurement or identification?

- Dave Gibson in Alberta Workers' Compensation, Safety & Health
- Reigert in B.C.
- Labrador City and Wabash: Iron ore deposits containing anthophylite.

8. What areas of research do you think deserve further work?

- Dose response
- Improved analytical method.
- Look at significance of finer fibres (sub-optical).

Interviewer: W.D. Brown Date: November 28, 1980

Q-30

ASBESTOS FIBRE MEASUREMENT SURVEY

My name is Doug Brown of the Ontario Research Foundation. We are doing a cross-Canada survey for Energy, Mines and Resources Canada to determine what work is being done on the measurement of inorganic fibres, particularly asbestos, in air and in water. This is needed for Energy, Mines and Resources own information and for the international technical co-operation program operated through the European Economic Community. Thus the information obtained in the survey will become public property.

Are you willing to spend a few minutes answering questions on your work in the area?

Name of Company Metrex Instruments Ltd.
Address 7687 Kimbel St., Mississauga, Ont. L5S 1E9
Telephone No. 677-8267
Name of Interviewee Dr. Jerry Motycka
Position President

1. Is work being done there on fibre measurement or identification?
   No ____ Terminate interview.
   Yes X Continue with 2. Just research - see Section 3.2

2. What types of fibres are you measuring or identifying?
   2.1 Asbestos? Yes ____ No ____
   2.1.1 If yes, what kinds of asbestos?
      Chrysotile
      Amosite
      Crocidolite
      Anthophylite
      Tremolite
      Actinolite
   2.2 Other fibres? Yes ____ No ____

2.2.1 If yes, what kinds of fibres?

____

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(In this questionnaire we refer specifically to asbestos fibres, as our major area of interest. However, we would also like to hear about any other inorganic fibres you may be working with).

____

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3. Are you measuring or identifying asbestos fibres in air?

No ____ Jump to Section 4.

Yes ___ What percentage of your work is measurement or identification in air as opposed to other media? ____%.

3.1 What percentage of your work on air measurements is service work as opposed to research? ________%

3.1.1 What percentage of your service work is on air from the work place as opposed to ambient air? _______%

3.1.1.1 What percentage of your air measurements from the work place is personal as opposed to static? ____%.

3.1.2. What general procedures do you use in your service work on air from the work place? (Include sampling, test procedure and instrumentation).

3.1.2.1 What modifications have you made in these procedures?

3.1.2.2 Have you developed any new instruments in your laboratory for use on air from the work place?
Yes _____ No _____

If yes, please describe.

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3.1.2.3 Have you imported any new instruments or attachments for use on air from the work place? Yes____ No ____

If yes, please describe.

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3.1.2.4 Are you obtaining information on sampling, test procedure, or instrumentation from outside Canada?

Yes _____ No _____

If yes, what sort of information and from whom?

3.1.2.5 Are you participating in an information exchange with persons outside Canada? Yes _____ No _____.

If yes, what sort of information are you exchanging, with whom, and on what basis? (through an organization (name?), personal contact, etc.).

3.1.3 What general procedures are you using on ambient air? (include sampling, test procedure and instrumentation).

3.1.3.1 What modifications have you made in these procedures?

3.1.3.2 Have you developed any new instruments or attachments for ambient air in your laboratory? Yes ____ No ____
If yes, please describe.

3.1.3.3 Have you imported any new instruments or attachments for ambient air? Yes ____ No ____.

If yes, please describe.

3.1.3.4 Are you obtaining information on sampling, test procedure or instrumentation for ambient air from outside Canada? Yes ____ No ____

If yes, what sort of information and from whom?

3.1.3.5 Are you participating in an information exchange with persons outside Canada on asbestos fibre measurements or identification in ambient air?

Yes ____ No ____

If yes, what sort of information are you exchanging, with whom and on what basis? (through an organization (name?), personal contact, etc.).

3.1.4 How much service work is actually done there on asbestos fibre in air?

3.1.4.1 Samples/Day: ____________

3.1.4.2 Dollar Value: ____________

3.1.4.3 What is the source of funds for this work?

3.1.5 How long has your laboratory been doing service work in asbestos fibre measurement or identification in air? ____ years.

3.1.6 What future plans do you have for the service work in asbestos fibre measurement and identification in air? (include possible changes in method and equipment).

3.2 Presumably the proportion of your activity in fibre measurement and identification which is not service work, is research. Is this a correct assumption?

No _____. Please explain.

Only research is done here.

Yes X . Continue through 3.2.1.

3.2.1 What research projects are underway on asbestos fibre measurement or identification in air?

3.2.1.1 On sampling?

Nothing

3.2.1.2 On test procedures?

Nothing.

3.2.1.3 On instrumentation?

Light scattering instrument where the light source is a light emitting diode and a semi-conductor silicon detector is used. Fibres are aligned in electrical field and identified by light scattering pattern,which is distinctly different from the pattern of dust. Should get sensitivity of < 1 fibre per c.c. where fibre is defined as having a diameter 1-2μm and aspect ratio > 3:1. The curve representing detection sensitivity vs. size should approximate the health hazard curve.

3.2.2 How much research work is actually done there on asbestos fibre measurement or identification in air?

3.2.2.1 Man-hours/week: 100

3.2.2.2 Dollar Value: $1,200.00

3.2.2.3 What is the source of funds for this work?

From regular sales of air pollution equipment and an IRAP grant of $80,000 for 1980.

3.2.3 Have you imported any specialty instruments or attachments for your research work on asbestos fibre in air?

Yes _____ No __X__

If yes, please describe.

3.2.4 Are you obtaining information or participating in an information exchange on research into the measurement or identification of asbestos fibres in air with persons outside Canada?

Yes _____ No __X__

If yes, what sort of information are you obtaining or exchanging, with whom and on what basis? (through an organization (name?) personal contact, etc.).

3.2.5 What past research work has your laboratory done on asbestos fibre measurement or identification in air?

3.2.5.1 On sampling?

3.2.5.2 On test procedures?

3.2.5.3 On instrumentation?

Light scattering computations and theoretical articles by Dr. Motycka while on U of T staff.

3.2.6 How long has your laboratory been doing research work on asbestos fibre measurement or identification in air?

About 4 years.

3.2.7 What future research work is planned on asbestos fibre measurement or identification in air?

3.2.7.1 On sampling?

3.2.7.2 On test procedure?

3.2.7.3 On instrumentation?

To perfect the light-scattering instrument.

4. Are you measuring or identifying asbestos fibres in water?

No _X__ Jump to Section 5.

Yes _____ What percentage of your work is measurement or identification in water as opposed to other media? _____%.

4.1 What percentage of your work on asbestos fibre measurement or identification in water is service work as opposed to research? _____%.

4.1.1 What general procedures do you use for asbestos fibre measurements or identification in water? (include sampling, test procedures and instrumentation).

4.1.1.1 What modifications have you made in these procedures?

4.1.1.2 Have you developed any new instruments or attachments in your laboratory for use in water measurement or identification? Yes ____ No _____

If yes, please describe? ________________________________

4.1.1.3 Have you imported any new instruments or attachments for use in water measurement or identification?

Yes ____ No ____

If yes, please describe?

4.1.1.4 Are you obtaining information on sampling, test procedure or instrumentation for measurement or identification of asbestos fibre in water from outside Canada?

Yes ____ No _____

If yes, what sort of information and from whom?

4.1.1.4 (Continued) If yes, what sort of information and from whom?

4.1.1.5 Are you participating in an information exchange with persons outside Canada on asbestos fibre measurement or identification in water?

Yes____ No _____

If yes, what sort of information are you exchanging, with whom and on what basis? (through an organization (name), personal contact, etc.).

4.1.2 How much service work is actually done there on the measurement and identification of asbestos fibres in water?

4.1.2.1 Man-hours/Week: ________

4.1.2.2 Dollar Value:

4.1.2.3 What is the source of funds for this work?

4.1.4 What are your future plans for asbestos fibre measurement and identification in water? (include possible changes in method and equipment.

4.2 Presumably, that proportion of your activity in asbestos fibre measurements or identification which is not service work, is research. Is this a correct assumption?

No _____ Please explain.

Yes ____ Continue through 4.2.1.

4.2.1 What research projects are underway on asbestos fibre measurement or identification in water?

4.2.1.1 On Sampling? ______

4.2.1.2 On test procedures?

4.2.1.3 On instrumentation?

4.2.2 How much research is actually done there on the measurement or identification of asbestos fibres in water?

4.2.2.1 Man-hours/week:
4.2.2.2 Dollar Value:

4.2.2.3 What is the source of funds for this work?

4.2.3 Have you imported any new instruments or attachments for your research work on asbestos fibre in water?

Yes ______ No ______

If yes, please describe.

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4.2.4 Are you obtaining information or participating in an information exchange on research into the measurement or identification of asbestos fibres in water with persons outside Canada?

Yes ______ No ______

If yes, what sort of information are you obtaining or exchanging, with whom and on what basis? (through an organization (name?) personal contact, etc.).

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4.2.5 What past research work has your laboratory done on asbestos fibre measurement or identification in water?

4.2.5.1 On sampling?______________________________________

4.2.5.2 On test procedures? ________________________________

4.2.5.3 On instrumentation?________________________________

4.2.6 How long has your laboratory been doing research work on asbestos fibre measurement or identification in water?____________________

4.2.7 What future research work is planned on asbestos fibre measurement or identification in water?

4.2.7.1 On sampling? ______

4.2.7.2 On test procedure? ______

4.2.7.3 On instrumentation? ______

5. Have you done any asbestos fibre identification in biological samples?

Yes ____ No __X__

If yes, on what samples and under what circumstances?

5.1 What procedures are you using on biological samples?

5.1.1 What modifications have you made in these procedures?

6. Have you done any asbestos fibre measurement or identification in media other than air, water or biological specimens?

Yes _____ NO _X_

If yes, on what materials and under what circumstances?

6.1 What procedures do you use?

6.1.1 What modifications have you made in these procedures?

7. Who else do you know in Canada is working on inorganic fibre measurement or identification?

Concord Scientific is sampling and measuring.

8. What areas of research do you think deserve further work?

Instant optical monitoring is important; also specification of health hazard criteria regarding particle size and shape.

Interviewer: W. D. Brown

Date: 26/11/80